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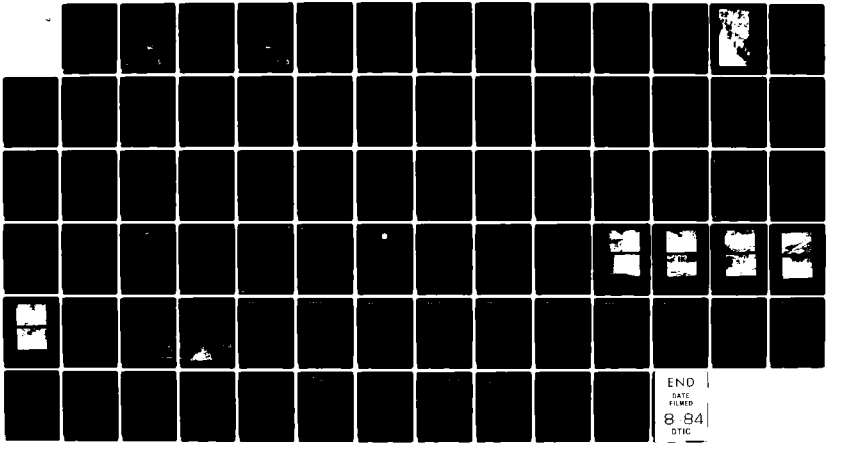

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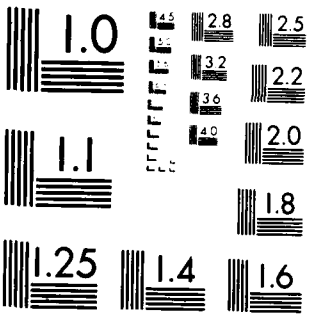

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CONNECTICUT COASTAL BASIN
TRUMBULL, CONNECTICUT

PINEWOOD LAKE DAM
CT 00080

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

NOVEMBER, 1979

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
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4. TITLE (and Subtitle) Conn. Coastal Basin Trumbull, Conn., Pinewood Lake Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
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18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Conn. Coastal Basin
Trumbull, Conn.
Pinewood Lake Dam

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The project, built in 1870, consists of a stone masonry and earthfill embankment dam, a stone and mortar masonry spillway and an earthfill dike. The dam is approx. 450 ft. -ong, 42 ft. wide at the crest and 22 ft. above the streambed of Booth Hill Brook. A stone masonry retaining wall forms the downstream face of the dam and is the highest part of the dam at elevation 173.3. The spillway, located 900± ft. northwest of the dam, is a 185 ft. long and 10 ft. high stone and mortar masonry weir. The dike, located just to the left of the spillway, is 6 ft. wide at the crest, 90 ft. long and 3.5 ft. high.

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CONNECTICUT COASTAL BASIN
TRUMBULL, CONNECTICUT

PINEWOOD LAKE DAM
CT 00080

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

NOVEMBER, 1979

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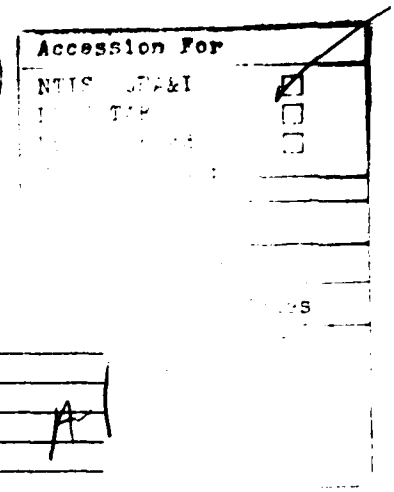

BRIEF ASSESSMENT

PHASE I INSPECTION REPORT

NATIONAL PROGRAM OF INSPECTION OF DAMS

Name of Dam:	PINEWOOD LAKE DAM
Inventory Number:	00080
State Located:	CONNECTICUT
County Located:	FAIRFIELD
Stream:	BOOTH HILL BROOK
Owner:	PINEWOOD LAKE ASSOCIATION
Date of Inspection:	SEPTEMBER 17, 1979
Inspection Team:	PETER M. HEYNEN, P.E.
	MIRON PETROVSKY
	HECTOR MORENO, P.E.
	GEORGE BASSILAKIS, P.E.
	JAY COSTELLO

The project, built in 1870, consists of a stone masonry and earthfill embankment dam, a stone and mortar masonry spillway and an earthfill dike. The dam is approximately 450 feet long, 42 feet wide at the crest and 22 feet above the streambed of Booth Hill Brook. A stone masonry retaining wall forms the downstream face of the dam and is the highest part of the dam at elevation 173.3. The spillway, located 900± feet northwest of the dam, is a 185 foot long and 10 foot high stone and mortar masonry weir. The dike, located just to the left of the spillway, is 6 feet wide at the crest, 90 feet long and 3.5 feet high.

The outlet facilities are a gated 20 inch ductile iron pipe and a stone masonry gatehouse located at the downstream face of the dam.

Based upon the visual inspection at the site and past performance of the dam, the project is judged to be generally in good condition. No evidence of instability in the dam embankment or spillway was observed. There are areas requiring maintenance and monitoring such as seepage at the downstream toe of the dam, erosion of the upstream slope of the dam, spalling of the mortar joints at the spillway and the lack of a low-level outlet pipe at the dam.

In accordance with Corps of Engineers Guidelines for size (Small) and hazard (High) classification, the test flood will be equivalent to the Probable Maximum Flood. Peak inflow to the lake is 9600 cubic feet per second (cfs); peak outflow is 9100 cfs with the dam overtopped 0.1 feet. The spillway capacity with the lake level to the top of dam is 7000 cfs, which includes overflow at the dike, and is equivalent to 77% of the routed test flood outflow.

The above recommendations and any further remedial measures which are discussed in Section 7, should be instituted within 1 year of the owner's receipt of this report.

Peter M. Heynen, P.E.
Project Manager
Cahn Engineers, Inc.

Edgar B. Vinal, Jr., P.E.
Senior Vice President
Cahn Engineers, Inc.

This Phase I Inspection Report on Pinewood Lake Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and are hereby submitted for approval.

CHARLES G. TIERSCH, Chairman
Chief, Foundation and Materials Branch
Engineering Division

FRED J. RAVENS, Jr., Member
Chief, Design Branch
Engineering Division

SAUL C. COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspection. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam would necessarily represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions will be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions there of. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as neccessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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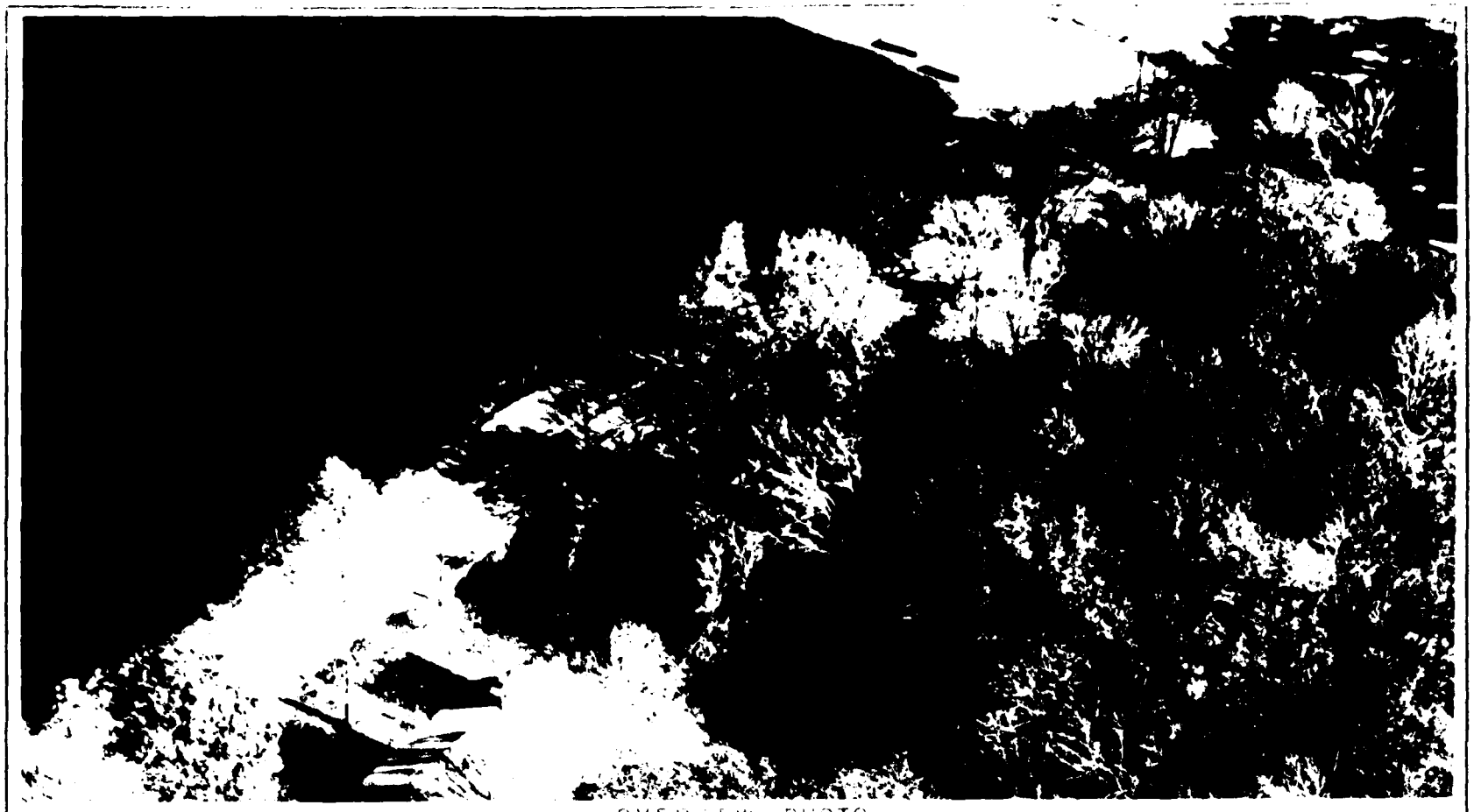

OVERVIEW PHOTO

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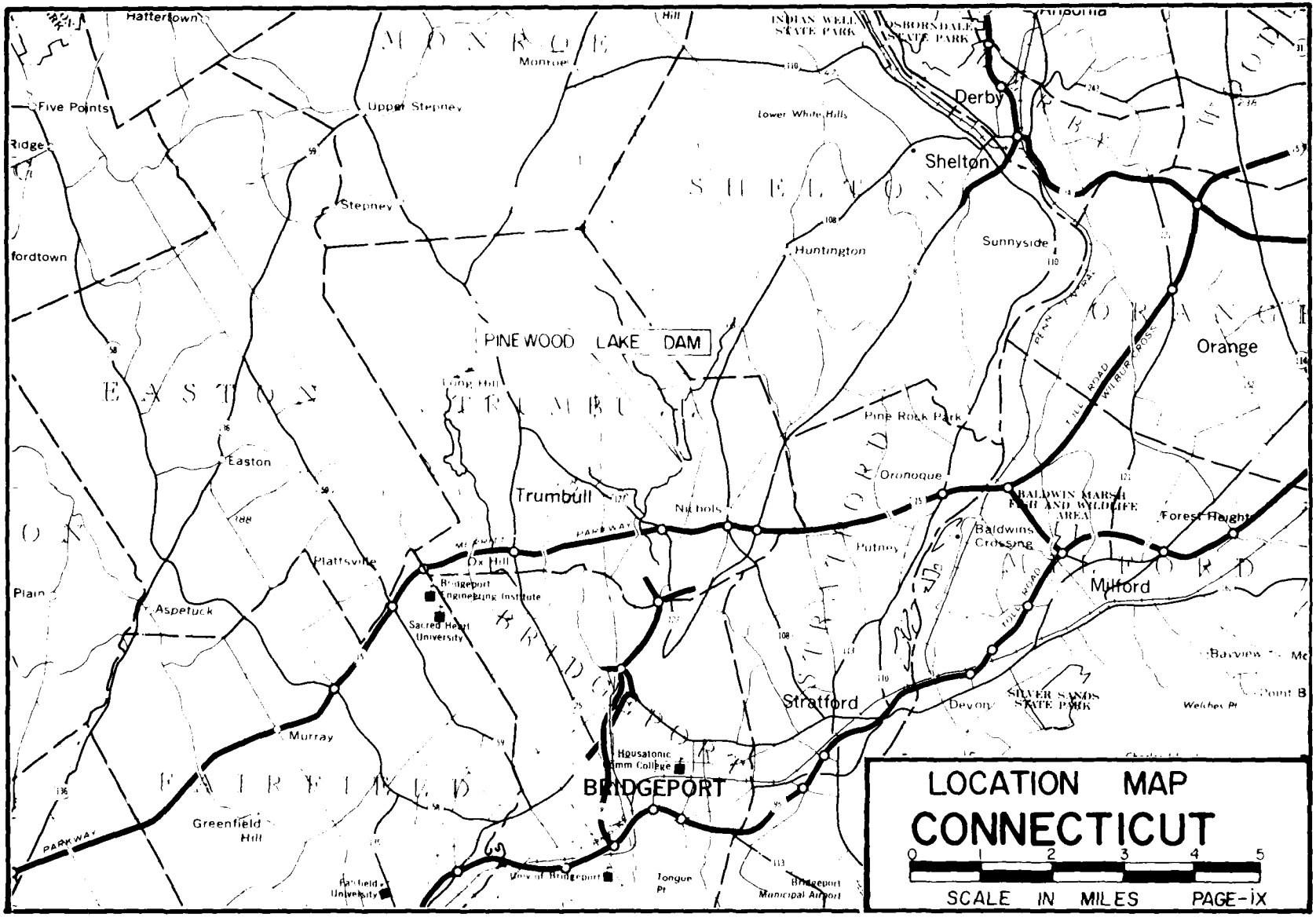
CAHN ENGINEERS INC [illegible] ENGINEER	INSPECTION OF NON-FED DAMS	Booth Hill Brook	CONNECTICUT	[illegible]


PINE WOOD LAKE DAM
Hatterstown
Monroe
Five Points
Upper Stepney
Lower White Hills
Derby
Shelton
Stepney
Huntington
Sunnyside
Orange
Easton
Trumbull
Pine Rock Park
Oronoque
Nichols
Baldwins Crossing
Putney
Forest Height
Mulford
Plattsville
Ox Hill
Aspetuck
Bridgeport Engineering Institute
Sacred Heart University
Stratford
Devon
SILVER SANDS STATE PARK
Murray
Housatonic Comm College
BRIDGEPORT
Greenfield Hill
Fairfield University
Tongue Pt
Bridgeport Municipal Airport
PARKWAY
LOCATION MAP
CONNECTICUT
0 1 2 3 4 5
SCALE IN MILES

PHASE I INSPECTION REPORT

PINEWOOD LAKE DAM

SECTION I - PROJECT INFORMATION

1.1 GENERAL

a. Authority - Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Cahn Engineers, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed were issued to Cahn Engineers, Inc. under a letter of March 30, 1979 from John P. Chandler Colonel, Corps of Engineers. Contract No. DACW 33-79-C-0059 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection Program - The purposes of the program are to:

1. Perform technical inspection and evaluation of non-federal dams to identify conditions requiring correction in a timely manner by non-federal interests.

2. Encourage and prepare the States to quickly initiate effective dam inspection programs for non-federal dam.

3. To update, verify and complete the National Inventory of Dams.

c. Scope of Inspection Program - The scope of this Phase I inspection report includes:

1. Gathering, reviewing and presenting all available data as can be obtained from the owners, previous owners, the state and other associated parties.

2. A field inspection of the facility detailing the visual condition of the dam, embankments and appurtenant structures.

3. Computations concerning the hydraulics and hydrology of the facility and its relationship to the calculated flood through the existing spillway.

4. An assessment of the condition of the facility and corrective measures required.

It should be noted that this report does not pass judgement on the safety or stability of the dam other than on a visual basis. The inspection is to identify those features of the dam which need corrective action and/or further study.

1.2 DESCRIPTION OF PROJECT

a. Location - The dam is located on Booth Hill Brook in a rural area of the town of Trumbull, County of Fairfield, State of Connecticut. The dam is shown on the Long Hill USGS Quadrangle Map having coordinates latitude N 41°15.1' and longitude W 73°10.4.

b. Description of Project and Appurtenances - The project consists of an earthfill and stone masonry dam, a stone and mortar masonry spillway and an earthfill dike. The spillway and dike are located approximately 900 feet northwest of the dam.

The dam, which is a stone masonry retaining wall with an earthfill embankment placed on the upstream side, is approximately 450 feet long, 22 feet above the streambed of Booth Hill Brook and 42 feet wide at the crest. The crest is irregular and is formed by the stone masonry retaining wall, a sidewalk, West Lake Road, and a strip of grassed fill (See Sheet B-1). The upstream slope is inclined at 2 horizontal to 1 vertical and the downstream face consists of two vertical masonry retaining walls. The upper retaining wall supports the main part of the embankment, is the highest part of the dam at elevation 173.3 and ranges in height from 22 feet at the gatehouse to 3 feet at the left side of the dam. The lower retaining wall is 3 to 5 feet high and forms a walkway to the gatehouse and also forms the outlet structure for a catch basin drain pipe (See Sheet B-1). There are two residential structures just downstream and at approximately the same elevation as the dam crest. One house is at the right end of the dam and one is at the left end.

The spillway is a 185 foot long and 10 foot high stone and mortar masonry weir. The crest elevation is 168.9± and water flowing over the spillway goes into a wide natural channel filled with large boulders. The dike extends approximately 90 feet across a small swale just to the left of the spillway. The dike is approximately 3.5 feet in height with a top elevation of 171.6 and 6± feet wide at the crest. There is a concrete retaining wall 2.5 feet in width forming the downstream face and hand placed riprap on the upstream slope.

The outlet is a 20 inch ductile iron pipe located at the central part of the dam. The outlet control valve is operated from the stone masonry gate house at the downstream face of the dam.

c. Size Classification: - SMALL - The dam impounds 630 acre-feet of water with the lake level to the top of the dam which at elevation 173.3, is 22 feet above the old streambed. According to the Recommended Guidelines, a dam with this height and storage capacity is classified as small in size.

d. Hazard Classification - HIGH - If the dam were breached, there is potential for loss of life and extensive property damage to at least 6 structures in a residential area approximately 2300 feet downstream and including Lincoln Street, Washington Street, Franklin Street and Larkspur Drive. The water level in this area would rise from a depth of 9.1 feet before the breach to a depth of 11.1 feet just after the breach.

e. Ownership - Pinewood Lake Association
P.O. Box 118 Pinewood Lake,
Trumbull, Conn.
Harvey Mamrus, President
Tel: (203) 377-3694 (Home)
(203) 368 3441 (Work)

The dam was originaly owned and built by the Bridgeport Hydraulic Company. The Pinewood Lake Association acquired the dam and the lake in the middle 1940's.

f. Operator - None

g. Purpose - Recreation

h. Design and Construction History - The following information is believed to be accurate based on the plans and correspondence available. The dam was built in 1890 and reconstructed in 1900 by the original owners, Bridgeport Hydraulic Company. In the early 1960's, the Hydro Construction Company was contracted to reconstruct West Lake Road. At this time the dam was widened on the upstream side and the outlet pipe was accidently crushed. This outlet was plugged with concrete and a new 20 inch pipe was placed 8-9 feet above the old outlet pipe. In the mid-1970's, the masonry gate house was refurbished and a new gate valve installed.

i. Normal Operational Procedures - The 20 inch outlet valve at the dam is operated every two or three years for lowering the lake level 7-8 feet to allow maintenance on the waterfront by lake property owners. The lake level is normally maintained at the spillway crest or elevation 168.9.

1.3 PERTINENT DATA

a. Drainage Area - 5.2 square miles of largely developed, rolling terrain.

b. Discharge at Damsite - Discharge is over the spillway and through the 20 inch outlet pipe at the central part of the dam.

1. Outlet Works (Conduits): 20 inch pipe at invert el. 161.4 — 60 cfs (12± feet of head)

2. Maximum known flood at damsite: — Unknown

3. Ungated spillway capacity @ top of dam el. 173.3
   - Spillway: 6300 cfs
   - Dike overflow: 700 cfs

4. Ungated spillway capacity @ test flood el. 173.4
   - spillway: 6500 cfs
   - dike overflow: 800 cfs

5. Gated spillway capacity @ normal pool: N/A

6. Gated spillway capacity @ test flood: N/A

7. Total spillway capacity @ top of dam el. 173.3: 7000 cfs

8. Total spillway capacity @ test flood el. 173.4: 7300 cfs

9. Total project discharge @ test flood el. 173.4: 9100 cfs

c. Elevations (National Geodetic Vertical Datum)

1. Streambed at centerline of dam: 152.1

2. Maximum tailwater: N/A

3. Upstream portal invert diversion tunnel: N/A

4. Recreation pool: 168.9

5. Full flood control pool: N/A

6. Spillway crest (ungated): 168.9

7. Design surcharge (original design): Unknown

8. Top of dam: 173.3

9. Test flood surcharge: 173.4

d. Reservoir

1. Length of maximum pool:	4300 ft.
2. Length of recreation pool:	4100 ft.
3. Length of flood control pool:	N/A

e. Storage

1. Recreation pool:	630 acre-ft.
2. Flood control pool:	N/A
3. Spillway crest pool:	630 acre-ft.
4. Top of dam:	920 acre-ft.
5. Test flood Pool:	920 acre-ft.

f. Reservoir Surface

1. Recreation pool:	60 acres
2. Flood control pool:	N/A
3. Spillway crest:	60 acres
4. Top of dam:	70 acres
5. Test flood pool:	70 acres

g. Dam

1. Type:	Earth Embankment
2. Length:	450 ft.
3. Height:	22 ft.
4. Top width:	42 ft.
5. Side slopes:	2H to 1V (Upstream) Vertical (Downstream)
6. Zoning:	N/A
7. Impervious Core:	N/A
8. Cutoff:	N/A
9. Grout curtain:	N/A
10. Other:	Masonry wall on downstream face

Spillway Dike

1. Type:	Earth Embankment
2. Length:	90 ft.
3. Height:	3.5 ft.
4. Top Width:	6 ft.
5. Other:	2.5 ft. wide concrete retaining wall on downstream face.

h. Diversion and Regulating Tunnel-N/A

i. Spillway

1. Type:	Stone masonry weir
2. Length of weir:	185 ft.
3. Crest elevation:	168.9
4. Gates:	N/A
5. Upstream Channel:	Natural lake bottom
6. Downstream Channel:	Large boulders in streambed
7. General:	N/A

j. Regulating Outlets - The only regulating outlet is the 20 inch pipe located at the central part of the dam and operated at the gate house.

1. Invert:	161.4
2. Size:	20"
3. Description:	Hand operated floor stand at gate house
5. Other:	N/A

SECTION 2: ENGINEERING DATA

2.1 DESIGN

a. Available Data - The available data consists of a plan and a section of the dam drawn by the Town of Trumbull, November 1976, and a topographic map by Abrams Aerial Survey Corporation, October 1964, obtained from the Town of Trumbull. Also available is correspondence from the State of Connecticut Department of Environmental Protection.

b. Design Features - The drawings and correspondence indicate the design features stated previously.

c. Design Data - There were no engineering values, assumptions, test results or calculations available for the original construction or subsequent widening of the dam.

2.2 CONSTRUCTION

a. Available Data - There was no data available for the original construction of the dam. Drawings are available as listed above in section 2.1a.

b. Construction Considerations - No information is available.

2.3 OPERATIONS

It is reported by the Pinewood Lake association that the spillway capacity has not been exceeded since acquisition of the property in the middle 1940's. No lake level readings are taken and no formal operation records are known to exist.

2.4 EVALUATION

a. Availability - Existing data was provided by the Town of Trumbull and the State of Connecticut Department of Environmental Protection. The owner made the project available for visual inspection.

b. Adequacy - The limited amount of detailed engineering data available was generally inadequate to perform an in-depth assessment of the dam, therefore, the assessment of this dam must be based on visual inspection, performance history, hydraulic computations of spillway capacity and approximate hydrologic judgements.

c. Validity - A comparison of record data and visual observations reveals no significant discrepancies in the record data.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General - The general condition of the dam is good. Inspection did reveal areas requiring maintenance and monitoring. The reservoir level was at elevation 168.9 with a small amount of water flowing over the spillway at the time of the inspection.

b. Dam

Crest - No misalignment of the crest was observed. Lateral and longitudinal cracks in the road pavement of 0.5 to 1 inch in width were noted at the central portion of the dam. The grassed strip at the upstream edge of the crest had some eroded areas (Photo 1).

Upstream Slope - The upstream slope is protected by large boulders scattered along the dam at the water level. Several eroded areas were observed on the slope, especially on the left end of the dam. The slope was covered by grass, brush and a few small trees (Photo 1).

Downstream Slope - The downstream slope is the vertical face of the two masonry retaining walls (Photos 2 thru 5). No visible seepage through the face of the walls, misalignment or displacement of the masonry was observed. A wet area with a seepage discharge of 1± gallons per minute and some brown silt deposits was noted at the right side of the toe of the dam (Sheet B-1, Photo 6). Brush and several trees of 10 to 12 inches in diameter were noted at the toe just behind the downstream face of the dam (Photos 2 thru 5). Brush, logs and other material, which is being dumped on the downstream side of the right abutment, was observed during the inspection.

Dike

Crest - The crest is overgrown with trees and brush. There was no noticeable cracks or misalignment in the concrete retaining wall (Photo 9).

Upstream Slope - The upstream slope, protected by hand-placed riprap, was very overgrown with brush and trees. Some displacement of the riprap stones was observed (Photo 10).

Downstream Slope - The downstream slope of the dike is a concrete retaining wall which extends across a small swale to the natural slope at each end of the dike. All of this area was covered by grass, brush and trees (Photo 9).

Spillway - Only the crest and the vertical downstream face were visible for inspection. Both were in good condition except for some spalling of the mortar joints from water flowing between the stone blocks. Some small trees were noted at the crest. No misalignment or seepage through the spillway and abutments was observed. The spillway discharge channel consisted of large boulders overgrown with brush (Photos 7 and 8).

c. Appurtenant Structures - The stone masonry of the gate house was in good condition. No efflorescence, cracks or seepage at the gate house walls was observed (Photo 5). At the time of our inspection, the upper level outlet pipe was dry and the low-level outlet had a small amount of seepage flowing from the pipe.

d. Reservoir Area - The area surrounding the reservoir is substantially developed and wooded.

e. Downstream Channel - The downstream channel runs in the natural bed of the old Booth Hill Brook. It is mostly undeveloped, steep-sided and wooded to the initial impact area.

3.2 EVALUATION

Based upon the visual inspection, the project is assessed as being generally in good condition. The following features which could influence the future condition and/or stability of the dam were identified.

1. Relatively sparse riprap and eroded areas on the upstream slope of the dam.

2. Cracks in the road pavement on the dam crest could lead to additional saturation of the dam and possible settlement.

3. Seepage through the right portion of the dam can potentially increase in flow, leading to instability of the downstream masonry wall.

4. Spalling of the mortar joints on the crest of the masonry spillway could lead to penetration of water into the body of the spillway and subsequent deterioration of the masonry.

5. Brush and trees on the crest, upstream and downstream slopes and toe of the dam, dike and spillway impede efficient monitoring and could increase seepage along the tree roots.

6. The lack of a low-level outlet could present problems if a situation should arise which would require draining the reservoir.

SECTION 4: OPERATIONAL PROCEDURES

4.1 REGULATING PROCEDURES

There is no formal operation procedure known to exist. The outlet at the dam is opened every 2-3 years for lowering the lake level, allowing maintenance to waterfront property.

4.2 MAINTENANCE OF DAM

There is no formal program of maintenance for the project.

4.3 MAINTENANCE OF OPERATING FACILITIES

No regular maintenance is performed for the 20 inch outlet and gate valve.

4.4 DESCRIPTION OF ANY FORMAL WARNING SYSTEM IN EFFECT

No formal warning system is in effect.

4.5 EVALUATION

A formal program of operation and maintenance should be implemented, including documentation of lake level readings and operation maintenance to provide complete records for future reference. Also, a formal warning system should be developed and implemented within the time frame indicated in Section 7.1c. Remedial operation and maintenance recommendations are presented in Section 7.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. General - The watershed is 5.2 square miles of largely developed rolling terrain. The dam is located on Booth Hill Brook and is basically a low surcharge storage - high spillage stone masonry and earth embankment structure. The dike will be considered as an auxiliary spillway for the hydraulic computations and included in the spillway capacity. A swale in West Lake Road, which passes over the dam, allows spillage to occur to the right of the dam before the dam itself is overtopped. The capacity of the swale is not included in the spillway capacity.

b. Design Data - No computations could be found for the original construction or subsequent installation of a new outlet pipe at a higher elevation.

c. Experience Data - No information was found to indicate that there has been any problems (including overtopping) arising at the dam.

d. Visual Observations - The spillway is founded on rock and the area at the dike is overgrown with brush and trees.

e. Test Flood Analysis - Based upon "Preliminary Guidance for Estimating Maximum Probable Discharge", dated March 1978, the watershed classification (rolling) and hydraulic/hydrologic computations, the test flood will be considered equivalent to the Probable Maximum Flood (PMF) of 9600 cfs. The one-half PMF is considered to be equivalent to 4800 cfs. Peak outflow is 9100 cfs with the dam overtopped by 0.1± (Appendix D-8) and with the swale in the road just to the right of the dam overtopped by 1.4 feet (Appendix D-3 and D-8). A lake elevation equal to the top of the dam will generate flows of 7,000 cfs over the spillway and 1,400 cfs over the road swale. The capacity of the spillway is approximately 77% of the routed test flood outflow.

f. Dam Failure Analysis - Utilizing the April, 1978, "Rule of Thumb Guidance for Estimating Downstream Dam Failure Hydrographs", the peak failure outflow from the dam breaching would be 15,300 cfs. A breach of the dam would result in a rise of 2.0 feet in the water level of the stream at the initial impact area, which corresponds to an increase in the water level from a depth of 9.1 feet just before the breach, to a depth of 11.1 feet just after the breach. The 9.1 foot depth generated prior to dam failure by the spillway discharge and spillage over the road swale would inundate 6 or more houses by some 3 feet. The rapid 2.0 foot increase in the water level generated by dam failure would increase the inundation of these houses to a depth of some 5 feet.

SECTION 6: STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations - The visual inspection did not reveal any indications of stability problems. There are areas of seepage, deterioration and erosion, as described in Section 3, however they are not considered stability concerns at the present time.

b. Design and Construction Data - The drawings and data available and listed in Appendix B were not sufficient to perform an in-depth stability analysis of the dam. No engineering assumptions, data or calculations could be found for the original design of the dam.

c. Operating Records - The operating records available do not include any indications of dam instability since its construction in 1890.

d. Post Construction Changes - The post-construction changes of the project include the following data:

(1) Dam reconstruction in 1900; however there is no information available for the work done on the dam.

(2) Widening of the upstream side of the dam and installation of a new 20 inch outlet pipe in the early 1960's. This pipe was placed 8 to 9 feet above the old outlet pipe, which was damaged during construction and plugged with concrete.

(3) Refurbishing of the gate house and installation of a new gate valve for the 20 inch outlet pipe in the mid 1970's.

e. Seismic Stability - The project is in Seismic Zone 1 and according to the Recommended Guidelines, need not to be evaluated for seismic stability.

SECTION 7: ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 PROJECT ASSESSMENT

a. Condition - Based upon the visual inspection of the site and past performance, the project appears to be in good condition. No evidence of structural instability was observed in the dam, dike or appurtenant structures. The dam embankment is generally in good condition with areas of minor concern which require maintenance and monitoring.

Based upon "Preliminary Guidance for Estimating Maximum Probable Discharge" dated March, 1978, the watershed classification and hydraulic/hydrologic computations, peak inflow to the lake is 9,600 cubic feet per second (cfs); peak outflow is 9,100 cfs with the dam overtopped 0.1 feet. Based upon our hydraulic computations, the spillway capacity to the top of dam is 7000 cfs, which is equivalent to approximately 77% of the routed Test Flood outflow.

b. Adequacy of Information - The information available is such that an assessment of the condition and stability of the project must be based solely on visual inspection, past performance and sound engineering judgement.

c. Urgency - It is recommended that the measures presented in Section 7.2 and 7.3 be implemented within 1 year of the owner's receipt of this report.

d. Need for Additional Information - There is a need for additional information as recommended in Section 7.2.

7.2 RECOMMENDATIONS

It is recommended that further studies be made by a registered professional engineer qualified in dam design and inspection pertaining to the following:

1. The affect of the present elevation of the outlet pipe on drawdown capabilities of the project. Recommendations for a means of lowering the lake level to the elevation of the original low-level outlet should be made by the engineer and implemented by the owner.

2. Installation of the outlet valve on the upstream side of the dam, so as to eliminate pressures in the outlet pipe when the valve is in a closed position.

7.3 REMEDIAL MEASURES

a. Operation and Maintenance Procedure - The following measures should be undertaken within the time period indicated in Section 7.1.c, and continued on a regular basis.

1. Round-the-clock surveillance should be provided by the owner during periods of unusually heavy precipitation or high project discharge. The owner should develop and implement a downstream warning system in case of emergencies at the dam.

2. A formal program of operation and maintenance procedures should be instituted and fully documented to provide accurate records for future reference.

3. A comprehensive program of inspection by a registered, professional engineer qualified in dam inspection should be instituted on a biennial basis.

4. Erosion on the upstream slope and crest of the dam should be filled, compacted and riprap protection placed. Riprap should also be placed along the entire upstream slope to protect against future erosion.

5. Cracks in the paved road on the dam crest and damaged joints on the spillway crest should be sealed.

6. The source of the seepage at the right side of the downstream toe of the dam should be identified and monitored periodically.

7. Trees and brush on the crest, upstream and downstream slopes and toe of the dam, dike and spillway should be removed. The cutting of grass and brush on these areas of the dam and dike should be continued as part of the routine maintenance.

8. The abandoned low-level outlet should be sealed to prevent further leakage from the pipe.

9. Remove brush, logs and other material dumped on the downstream side of the right abutment.

7.4 ALTERNATIVES

This study has identified no practical alternatives to the above recommendations.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT Pinewood Lake Dam DATE: September 17, 1979

TIME: 9:30 am – 0:30 pm

WEATHER: Sunny, 70°F

W.S. ELEV. 168.9 U.S. _____ DN.S

PARTY:	INITIALS:	DISCIPLINE:
1. Peter M Heynen	PMH	Geotechnical
2. Miron Petrovsky	MP	Geotechnical
3. Hector Moreno	HM	Hydraulic
4. George Bassilakis	GB	Hydraulic
5. Jay Costello	JC	Geotechnical
6. Frank Segaline	FS	Survey

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Dam	PMH, MP, FS, JC	
2.	Dike	PMH, MP, FS, JC	
3.	Masonry Spillway	GB, HM, MP, FS	
4.	Gatehouse	PMH, MP, JC	
5.	Low-Level Outlet	PMH, MP, JC, HM	
6.			
7.			
8.			
9.			
10.			
11.			
12.			

PERIODIC INSPECTION CHECK LIST

PROJECT Pinewood Lake Dam DATE Sept. 17, 1979

PROJECT FEATURE Dam BY PMH, MP, FS, JC

AREA EVALUATED	CONDITION
DAM EMBANKMENT	
Crest Elevation	173.3
Current Pool Elevation	168.9
Maximum Impoundment to Date	Unknown
Surface Cracks	None observed
Pavement Condition	Cracks on central portion of crest
Movement or Settlement of Crest	None observed
Lateral Movement	
Vertical Alignment	Appears good
Horizontal Alignment	
Condition at Abutment and at Concrete Structures	Good
Indications of Movement of Structural Items on Slopes	None observed
Trespassing on Slopes	Some
Sloughing or Erosion of Slopes or Abutments	Erosion on u/s slope
Rock Slope Protection-Riprap Failures	Sparse boulders
Unusual Movement or Cracking at or Near Toes	None observed
Unusual Embankment or Downstream Seepage	Seep & wet area at d/s toe
Piping or Boils	None observed
Foundation Drainage Features	Unknown
Toe Drains	
Instrumentation System	N/A

PERIODIC INSPECTION CHECK LIST

PROJECT Diamond Lake Dam DATE Sept 17 1979

PROJECT FEATURE Dike BY PMH, MPES, JC

AREA EVALUATED	CONDITION
DIKE EMBANKMENT	
Crest Elevation	171.6
Current Pool Elevation	168.9
Maximum Impoundment to Date	Unknown
Surface Cracks	None observed
Pavement Condition	N/A
Movement or Settlement of Crest	None observed
Lateral Movement	
Vertical Alignment	Appears good
Horizontal Alignment	
Condition at Abutment and at Concrete Structures	Good
Indications of Movement of Structural Items on Slopes	N/A
Sloughing or Erosion of Slopes or Abutments	None observed
Rock Slope Protection-Riprap Failures	Heavy vegetation
Unusual Movement or Cracking at or Near Toes	None observed
Unusual Embankment or Downstream Seepage	
Piping or Boils	
Foundation Drainage Features	N/A
Toe Drains	
Instrumentation System	
Trespassing on Slopes	Some

PERIODIC INSPECTION CHECK LIST

PROJECT Pinewood Lake Dam DATE Sept. 17, 1979

PROJECT FEATURE Gatehouse BY PMH, MP, JC

AREA EVALUATED	CONDITION
OUTLET WORKS-CONTROL TOWER	Stone masonry structure
a) Concrete and Structural	
General Condition	Good
Condition of Joints	Not observed
Spalling	None observed
Visible Reinforcing	N/A
Rusting or Staining of Concrete	N/A
Any Seepage or Efflorescence	None observed
Joint Alignment	Not observed
Unusual Seepage or Leaks in Gate Chamber	None observed
Cracks	
Rusting or Corrosion of Steel	N/A
b) Mechanical and Electrical	
Air Vents	N/A
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	20" gate valve, operable
Emergency Gates	
Lightning Protection System	N/A
Emergency Power System	
Wiring and Lighting System	

PERIODIC INSPECTION CHECK LIST

PROJECT Pinewood Lake Dam DATE Sept. 17, 1979

PROJECT FEATURE Low-Level Outlet BY PMH, MP, JC, HM

AREA EVALUATED		CONDITION
OUTLET WORKS-OUTLET STRUCTURE AND OUTLET CHANNEL		Downstream Masonry Wall of Gatehouse
General Condition of Concrete		Good
Rust or Staining		N/A
Spalling		None observed
Erosion or Cavitation		
Visible Reinforcing		N/A
Any Seepage or Efflorescence		None observed
Condition at Joints		Good
Drain Holes		N/A
Channel		
Loose Rock or Trees Overhanging Channel		Some trees
Condition of Discharge Channel		Boulders, logs and brush in channel

PERIODIC INSPECTION CHECK LIST

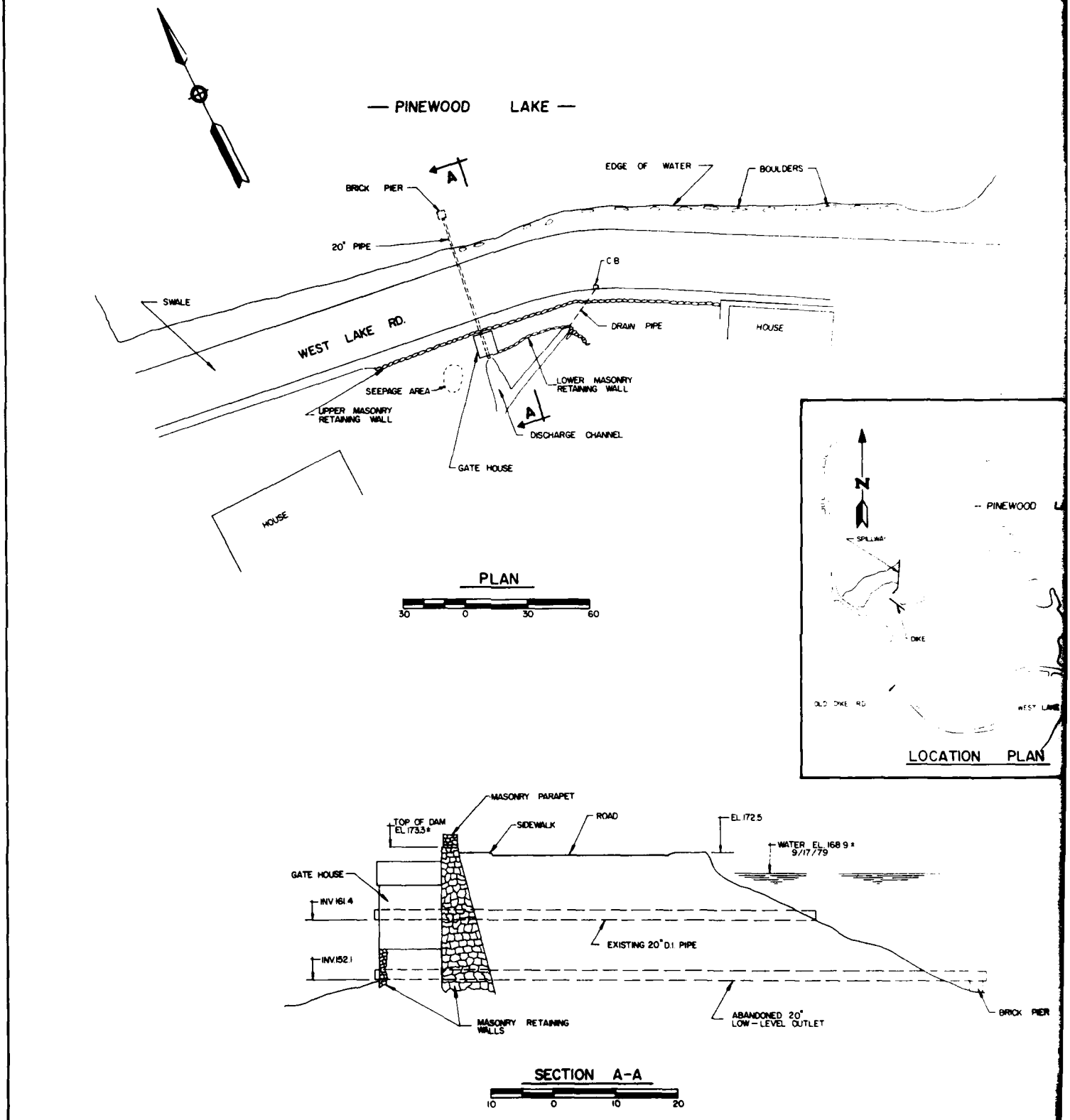
PROJECT Pinewood Lake Dam DATE Sept. 17, 1979

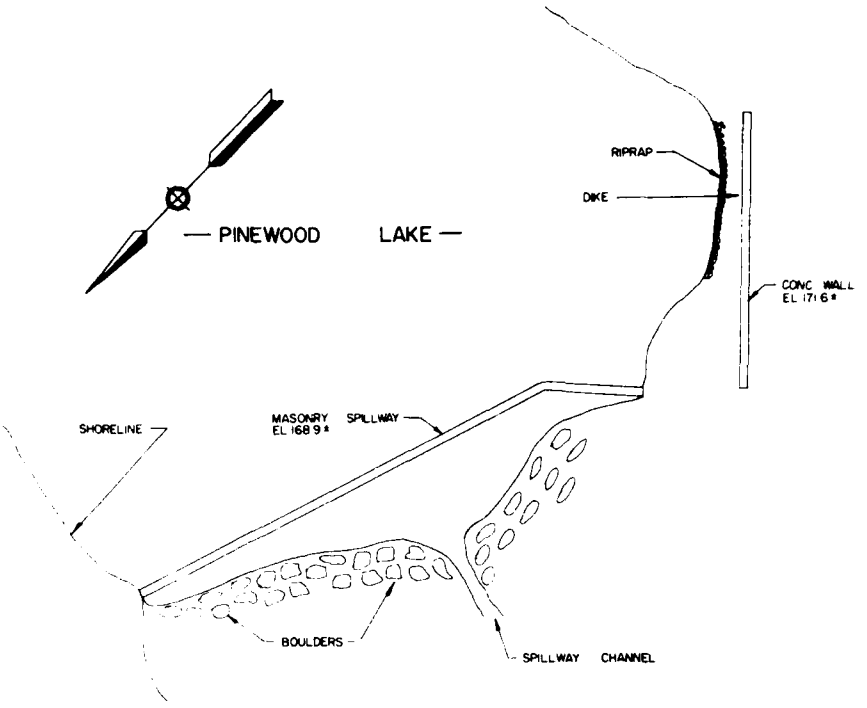
PROJECT FEATURE Masonry Spillway BY PMH, MP, JC

AREA EVALUATED		CONDITION
OUTLET WORKS-SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS		Stone Masonry Structure
a) Approach Channel		
General Condition		Good
Loose Rock Overhanging Channel		None observed
Trees Overhanging Channel		
Floor of Approach Channel		Not observed
b) Weir and Training Walls		
General Condition of Concrete		Good
Rust or Staining		N/A
Spalling		Damage mortar joints on crest
Any Visible Reinforcing		N/A
Any Seepage or Efflorescence		None observed
Drain Holes		N/A
c) Discharge Channel		
General Condition		Fair
Loose Rock Overhanging Channel		None observed
Trees Overhanging Channel		Some
Floor of Channel		Bedrock
Other Obstructions		Boulders, trees & brush in spillway channel

APPENDIX B

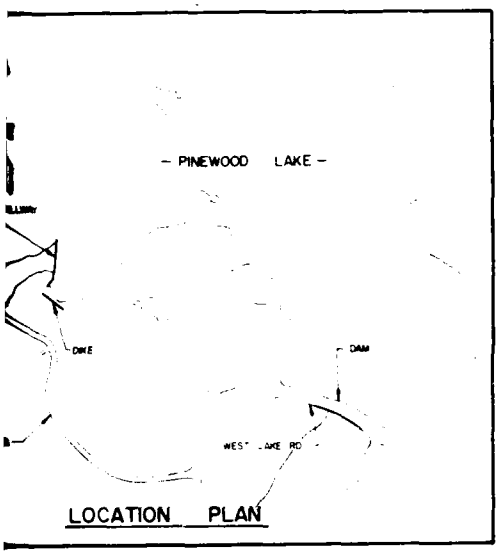
ENGINEERING DATA AND CORRESPONDENCE


— PINEWOOD LAKE —
EDGE OF WATER
BOULDERS
BRICK PIER
A
20" PIPE
C B
SWALE
WEST LAKE RD.
DRAIN PIPE
HOUSE
SEEPAGE AREA
LOWER MASONRY RETAINING WALL
UPPER MASONRY RETAINING WALL
A
DISCHARGE CHANNEL
GATE HOUSE
HOUSE
PLAN
30 0 30 60
N
— PINEWOOD
SPILLWAY
DIKE
OLD DIKE RD
WEST LAKE
LOCATION PLAN
MASONRY PARAPET
TOP OF DAM EL 173.3 ±
SIDEWALK
ROAD
EL 172.5
WATER EL 168.9 ± 9/17/79
GATE HOUSE
INV 161.4
EXISTING 20" D.I. PIPE
INV 152.1
MASONRY RETAINING WALLS
ABANDONED 20" LOW-LEVEL OUTLET
BRICK PIER
SECTION A-A
10 0 10 20



SPILLWAY PLAN

30 0 30 60



LOCATION PLAN

BRICK PIER

NOTES:

1 THIS PLAN WAS COMPILED FROM EXISTING PLANS BY THE TOWN OF TRUMBULL, DATED NOV 9, 1976 AND SUPPLEMENTARY SURVEY BY CAHN ENGINEERS, SEPTEMBER 1979
NOT ALL TOPOGRAPHIC AND/OR STRUCTURAL FEATURES ARE IDENTIFIED

2 ALL ELEVATIONS ARE NATIONAL GEODETIC VERTICAL DATUM TAKEN FROM EXISTING PLANS AND SURVEY

CAHN ENGINEERS INC WALLINGFORD, CONNECTICUT ENGINEER	U S ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

PLAN AND SECTION

PINEWOOD LAKE DAM

BOOTH HILL BROOK TRUMBULL, CONNECTICUT

DRAWN BY	CHECKED BY	APPROVED BY	SCALE AS NOTED	
H.A.	JAC	PAC	DATE NOV 1979	SHEET B-1

PINEWOOD LAKE DAM

EXISTING DATA

"Gatehouse and Pipe for Pinewood Lake"
November 9, 1976
Town Engineering Office
Trumbull, Conn.
2 sheets

"Topographic Map of Town of Trumbull, Connecticut"
July, 1964
Abrams Aerial Survey Corp.
Lansing, Michigan
Sheets I-7, I-8, H-8

SUMMARY OF DATA AND CORRESPONDENCE

Date	To	From	Subject	Page
July 24, 1964	Files	Water Resources Commission State of Connecticut Department of Environmental Protection	Inventory Data	B-2
Oct. 4, 1965	Lt. Col. John Reid	Thomas H. Nash	Inspection at dam on Booth Hill Brook Upstream from Pinewood Lake	B-3
Oct. 31, 1977	Robert Somichsen	Glenn G. Wright Pinewood Lake Association	Installation of new pipe and valve at dam.	B-5
Nov. 1, 1977	File	Paul A. Kallmeyer, P.E./ L.S. Town Engineer, Trumbull, Conn.	Notes on Pinewood Lake	B-6
Nov. 4, 1977	Edward Curtiss, Chairman, Pinewood Lake Association	Inland Wetlands and Water Courses Commission, Connecticut Department of Environmental Protection	Permit for installation of pipe	B-7
Aug. 30, 1978	File	Paul A. Kallmeyer, P.E./ L.S. Town Engineer, Trumbull, Conn.	Notes from meeting concerning pipe installation	B-8

No. TR - 9

Inventoried By WMS

Date 24 JULY 1964

WATER RESOURCES COMMISSION
SUPERVISION OF DAMS
INVENTORY DATA

Lon 73-10.4
Lat 41-15.1

Name of Dam or Pond PINEWOOD LAKE

Code No. PQ 5.7 BH 11

Nearest Street Location BIRCHWOOD ROAD

Town TRUMBULL

U.S.G.S. Quad. LONG HILL

Name of Stream BOOTH HILL BROOK

Owner Pinewood Lake Ass. Inc.

Address P.O. Box
Trumbull

VK
1/73

Pond Used For RECREATION DA 5.205M 590

Dimensions of Pond: Width 600 FEET Length 4100 FEET Area

Total Length of Dam 250 FEET Length of Spillway 100'

Location of Spillway ~~NONE VISABLE, LAKE OVERFLOWS ON WEST~~ LOCATED ON WEST SIDE OF LA

Height of Pond Above Stream Bed 25 FEET

Height of Embankment Above Spillway 3 FEET

Type of Spillway Construction NONE VISABLE MASONRY

Type of Dike Construction MASONRY, ROAD ON TOP

Downstream Conditions WOODS, BRIDGEPORT

Summary of File Data

Remarks

Would Failure Cause Damage? YES Class B

October 4, 1965

Lt. Col. John Reid
236 Pinewood Trail
Trumbull, Connecticut

Dear Colonel Reid:

Reference is made to your letter asking for an investigation of the lack of flow in a brook that leads into Pinewood Lake. A field inspection was made on September 14, 1965 just after a rain, on September 30, 1965 after a period of no rain, and again on October 1, 1965 during a heavy rainfall.

The State laws concerning dams place under the jurisdiction of this Commission any dams, "which, by breaking away or otherwise, might endanger life or property" (Section 25-110). As a result of the inspection it is our opinion that the dam which Mr. Fenyes built would not endanger life or property if it failed and therefore is not under State jurisdiction. It was noted that water was flowing over a low spot in the dam and was also flowing in the brook tributary to Pinewood Lake. There was no sign that Mr. Fenyes was using the water on the dates of the inspections.

The drainage area above the location where the dam has been constructed is so small that it is not surprising that the stream flow would be negligible during the recent dry spell. It was also observed that other similar or slightly larger drainage areas in your immediate vicinity are not producing any significant stream flow. These observations apply to the other tributaries to Pinewood Lake as well as the one about which you complain.

The investigation also brought out the fact that there was no significant flow from the impoundment immediately upstream of where the dam you mentioned has recently been constructed. We would not expect that the new construction would be responsible for reducing the stream flow when none is being received from the upstream impoundment.

If the use of water for irrigation represents a difficulty to you, this is a matter of your property rights against that of the upstream user and no statutory control of such matters is assigned to this agency.

Very truly yours,

Thomas H. Nash
Field Inspector

THN:dlp

October 28, 1977

WATER RESOURCES
UNIT
RECEIVED
OCT 31 1977
ANSWERED
REFERRED
FILED

State Office Bldg.
Room 215
165 Capital Avenue
Hartford, CT 06115

ATTN: Robert Somichsen

Gentlemen:

The following is what and how we will install new pipe and valve at Pinewood Lake.

1. Pipe- 20" Ductile Iron approx. 80' long.
2. Steel collars welded to pipe (4) more if required.
3. All unsuitable material taken out of trench to be replaced with bankrun gravel.
4. All materials will be mechanically compacted at various levels when returing material to trench.
5. Up stream end of pipe will be placed on a sturdy foundation.
6. Up stream trash rack to be installed per your specifications or recomendations.
7. Down stream catch dam made of straw ad wire fence to be installed to catch silt.
8. Pipe will be welded together with steel rod.

All the above has been incorporated into our contract with our contractor. Also the Town of Trumbull will be suprised to see that all your requirements are followed as well as theirs.

Thank you for your cooperation and if at all possible give the deliverer of this letter some letter of approval as we have our hearing with the Inland-Wetland Commission Monday night, October 31, 1977.

Yours truly,

Glenn G. Wright

Glenn G. Wright
Pinewood Lake Association
136 Old Dyke Road
Trumbull, CT 06611

CONNECTICUT

JOHN K. DONNELLY
DIRECTOR OF PUBLIC WORKS

PAUL A. KALLMEYER
TOWN ENGINEER

TOWN HALL
PHONE 261-3631

November 1, 1977

NOTES: reference Pinewood Lake,
Trumbull, Conn.

1. Dam was constructed in 1890
Re-constructed in 1900

2. The statistics of the dam are:
   a. Thirty (30') feet high
   b. 3.3' to the spillway

   Implying that there is 26.7' of water impounded behind the spillway.

3. The elevation of the dam is 168.8 feet, and therefore, the elevation of the spillway is 165.6 feet.

4. The dam is 350 feet long, and the spillway is 185 feet wide.

5. The surface of the lake is 63.8 acres, and impounds 205 million gallons of water.

The above information obtained from "one of a kind" text on file in the office of Mr. D. Loiselle, Bridgeport Hydraulic Company, and submitted to the Town of Trumbull Engineering Department by Mr. John DeCelle, Engineering Department of the Bridgeport Hydraulic Company.

PAK

Paul A. Kallmeyer, PE/LS
Town Engineer

Town of Trumbull

CONNECTICUT

TOWN HALL
TRUMBULL, CONNECTICUT

November 4, 1977

CERTIFIED

Mr. Edward Curtis, Chairman
Pinewood Lake Association
P.O. Box 118
Pinewood Lake
Trumbull, Connecticut 06611

Re: Application #77-27

Dear Mr. Curtis:

The subject application was received on October 20, 1977 and was reviewed by the Inland Wetlands and Water Courses Commission for permission to excavate and install a new pipe for the purpose of providing means of lowering Pinewood Lake.

On November 1, 1977 the Inland Wetlands and Water Courses Commission of the Town of Trumbull voted as follows:

That the proposed activity is not a significant activity under the regulations and is approved to proceed without a public hearing of the Inland Wetlands and Water Courses Commission subject to the following condition:

1. A formal note must be added to the plans stating, "the new pipe shown hereon is not the design of the Town Engineer".

Work shall proceed according to the plans presented, subject to the attached general conditions.

Said action has been fixed to become effective on November 7, 1977 and a copy thereof has been filed and recorded in the office of the Town Clerk

INLAND WETLANDS AND WATER COURSES COMMISSION
OF THE TOWN OF TRUMBULL

Barbara W. Maslen, Secretary

BWM:kb
Enc.
cc: Town Clerk
Town Engineer
Commissioner D.E.P.
Mr. James Boyhen
Mr. Glenn Wright
✓File

CONNECTICUT

APPLICATION FOR PERMIT
(INLAND WETLANDS AND WATER COURSES)

General information to be supplied by all applicants for a permit.

1. Name of Applicant Pinewood Lake Association

Address P.O. Box 118, Pinewood Lake, Trumbull, Conn. Telephone _____

Business Address Chairman Lake Preservation - Edward Curtis Telephone 375-5507
President - James Boyhen Telephone 377-4778

2. Name of property owner of record Town of Trumbull, Pinewood Lake Association

Address _____ Telephone _____

Business Address _____ Telephone _____

3. The undersigned hereby authorizes _____

(Applicant) to act as Agent in my behalf as related to this application.

_____
(Owner)

WATER RESOURCES UNIT
RECEIVED
SEP 11 1978
ANSWERED _____
REFERRED _____
FILED _____

Indicate if other than property owner -

Applicant's interest in property (lessee, licensee, etc.)

Lake Pipe & Valve under West Lake Road

4. Location of property as identified in the Land Records of Trumbull, Connecticut on file in the office of the Town Clerk

Dam at South End of Pinewood Lake (West Lake Road)

5. Names and addresses of adjacent property owners

Donegan, John 62 West Lake Road

Zitnay, Andrew Lot (West of Pipe on West Lake Road)

6. Description of proposed activity and location of property: Include listing of all proposed regulated activities.

Excavation, installation of new pipe and value at a depth of 14' to 17' below main water level, and repair of road. Purpose is to provide means of lowering Pinewood Lake farther than is now possible, thereby, permitting dredging of the lake bottom and aiding in improving quality of lake water.

15. Physical Data

a. Material to be deposited and/or excavated

1. Area. 10,000 CU YARDS, OUR AREA IS 800 SQ FT.
2. Volume.
3. Physical composition (texture, components) of material to be deposited. re: deposition of existing materials
4. Chemical composition of all toxic materials, whether such materials are enclosed in containers or deposited openly. N/A
5. Potential chemical reactions of deposited materials yielding toxic products or concentrations of products hazardous to the ecosystem. N/A
6. Final height of filled area above seasonal high water table. N/A
7. Texture and composition of soil left after excavation. as existing
8. Slope of excavation. OPEN TRENCH 2° 16 FT DEEP
9. Depth to water table or water level if inundated after excavation. N/A

16. Water Course Data

a. Open water characteristics

1. Size of ponds or lakes. 7.2 ACRES
2. Maximum depth and if possible volume of water. 17 FT DEEP 228,000 GALS

b. Stream characteristics

1. Intermittent or permanent. permanent
2. Minimum and maximum seasonal flows. varies, this area is an auxilliary spillway

c. Known flood levels to be indicated on map (25-year flood)

none

d. Discharges if any

1. Type N/A
2. Frequency and volume N/A
3. Chemical composition N/A

e. Creation of new water bodies - Detailed information will be required.

N/A

Town of Trumbull

CONNECTICUT

JOHN K. DONNELLY
DIRECTOR OF PUBLIC WORKS

PAUL A. KALLMEYER
TOWN ENGINEER

TOWN HALL
PHONE 261-3631

August 30, 1978

Notes with reference to a Pre-construction meeting, concerning the Pinewood Lake Pipe Project, held as of this date, in the conference room of the Town Hall, Trumbull, Conn.

Present: Paul A. Kallmeyer, PE/LS, Town Engineer
Capt. Jon Ebling, Police Department
Joseph Adzima, Fire Marshal
Chief Douglas Doyle, Nichols Fire Dept.
Frederick Bietsch, Liasion Officer, Pinewood Lake Assn.
Glen Wright, President, Pinewood Lake Assn.
Richard Stinchcomb, Secretary, Pinewood Lake Assn.
Edward Curtis, Representative, Pinewood Lake Assn.
Shelley Ralston, Emergency Medical Services
Larry Burns, Bridgeport Hydraulic Company
Mr. Domonic DiCamillo, Contractor

* (Mr. Wm. Stevenson, Board of Education, did not attend the meeting).

1. Seventeen (17') to eighteen (18') feet of excavation depth.

2. To start the last week in September; waiting for pipe delivery-twenty (20") inch; ordered one week ago; four to five week delivery.

3. Boulders from the excavation shall not be used for backfill.

4. Larry Burns, Bridgeport Hydraulic Co.: Do we have Corps of Engineers permit? Glen Wright - advised by the State not to go for it.

5. Road closed - ten (10) to fourteen (14) days.

6. Mr. DiCamillo - says five (5) days, if all goes well.

Pre-Construction Meeting, August 30, 1978
Pinewood Lake Pipe Project

7. Barricades - to be placed by Town at the following four (4) locations:

   a. West Lake Road at Old Dike Road (with an opening for local traffic only).

   b. East Lake Road at Southgate Road (with an opening for local traffic only).

   c. One at each side of proposed construction.

** 8. To recheck with Southern Conn. Gas Co. again.

9. Need a week's notice from Pinewood Lake Assn. for newspapers, schools and Emergency Medical Service. Town will then contact all parties.

10. Town will notify Board of Education - re school busses. (under same arrangement as Item #9).

11. Contractor must leave intersection of Old Saw Mill Road and West Lake Road open from any vehicular parking.

12. Pinewood Lake Assn. will have a night watchman; no public knowledge is to be made of this fact.

13. Coordinate with Police Dept. on scuba divers for Sept. 11, 1978 - start of lowering of lake.

14. Suggest permanent buoys or markers on the cages.

* Spoke with Mr. Wm. Stevenson, Board of Education, at 11:00 a.m. and informed him of the meeting.

** Spoke with Mr. Ken Ryan, Southern Conn. Gas Co. at 11:00 a.m., and he said "no gas".

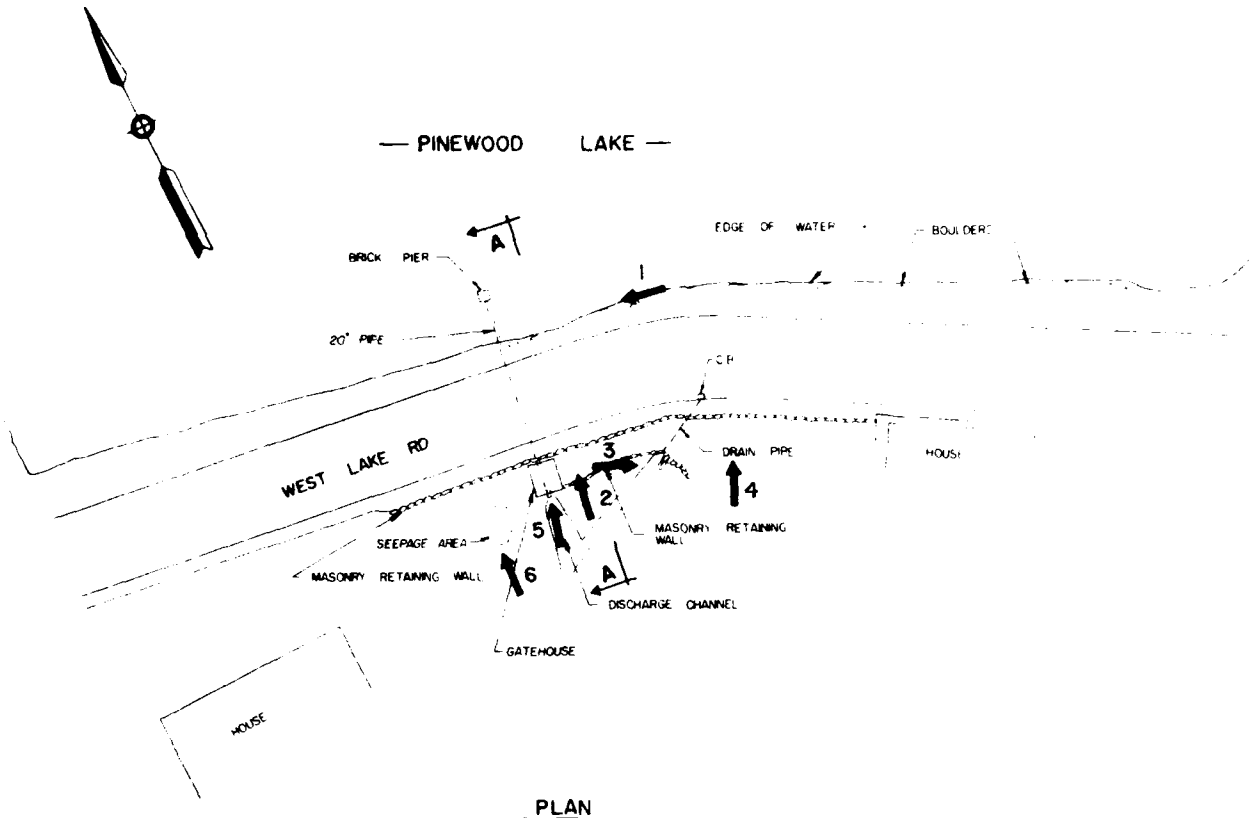
Respectfully submitted,

Paul A. Kallmeyer, PE/LS
Town Engineer

K:aod
cc: To all present
file

APPENDIX C

DETAIL PHOTOGRAPHS



PLAN

30 0 30 60

NOTE: PHOTOS 7,8,9,10 WERE TAKEN AT THE SPILLWAY AND SPILLWAY DIKE AND ARE NOT SHOWN ON THIS PLAN.

PHOTO LOCATION PLAN

PINEWOOD LAKE DAM

SHEET C-1

Photo 1 - Upstream slope and crest of dam (Sept. 1979)

US ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS CAHN ENGINEERS INC WALLINGFORD CONN ENGINEER	NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS	Pinewood Lake Dam Booth Hill Brook Trumbull, Connecticut CE # 27 6[illegible] DATE NOV. 19[illegible] PAGE

Photo 3 - Downstream toe of dam left of gatehouse (Sept 1979)

Photo 4 - Downstream face and toe of dam (Sept 1979)

Photo 5 - Gatehouse and outlet discharge channel (Sept 1979)

Photo 6 - Seep at right side of toe of dam (Sept 1979)

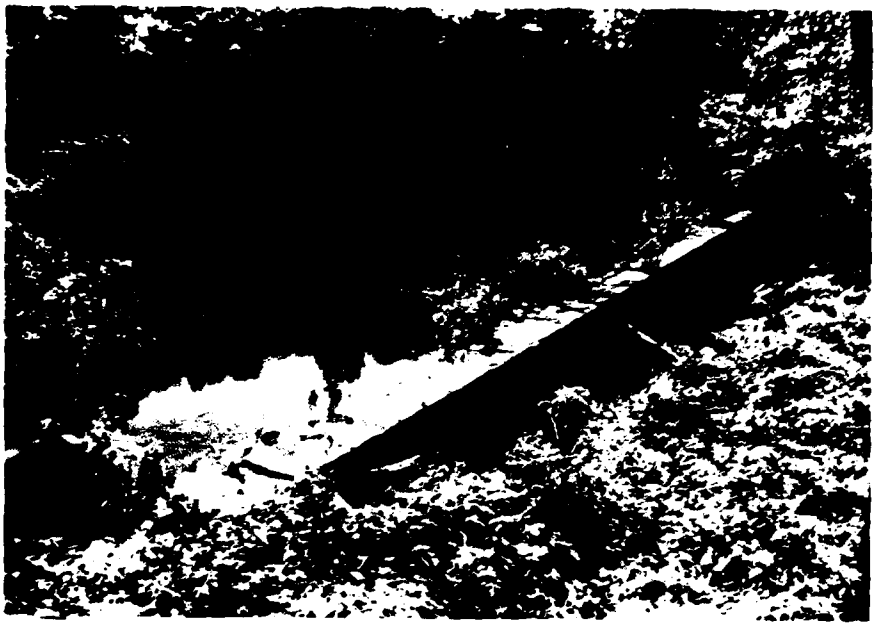


Photo 7 - Masonry spillway (Sept. 1979)

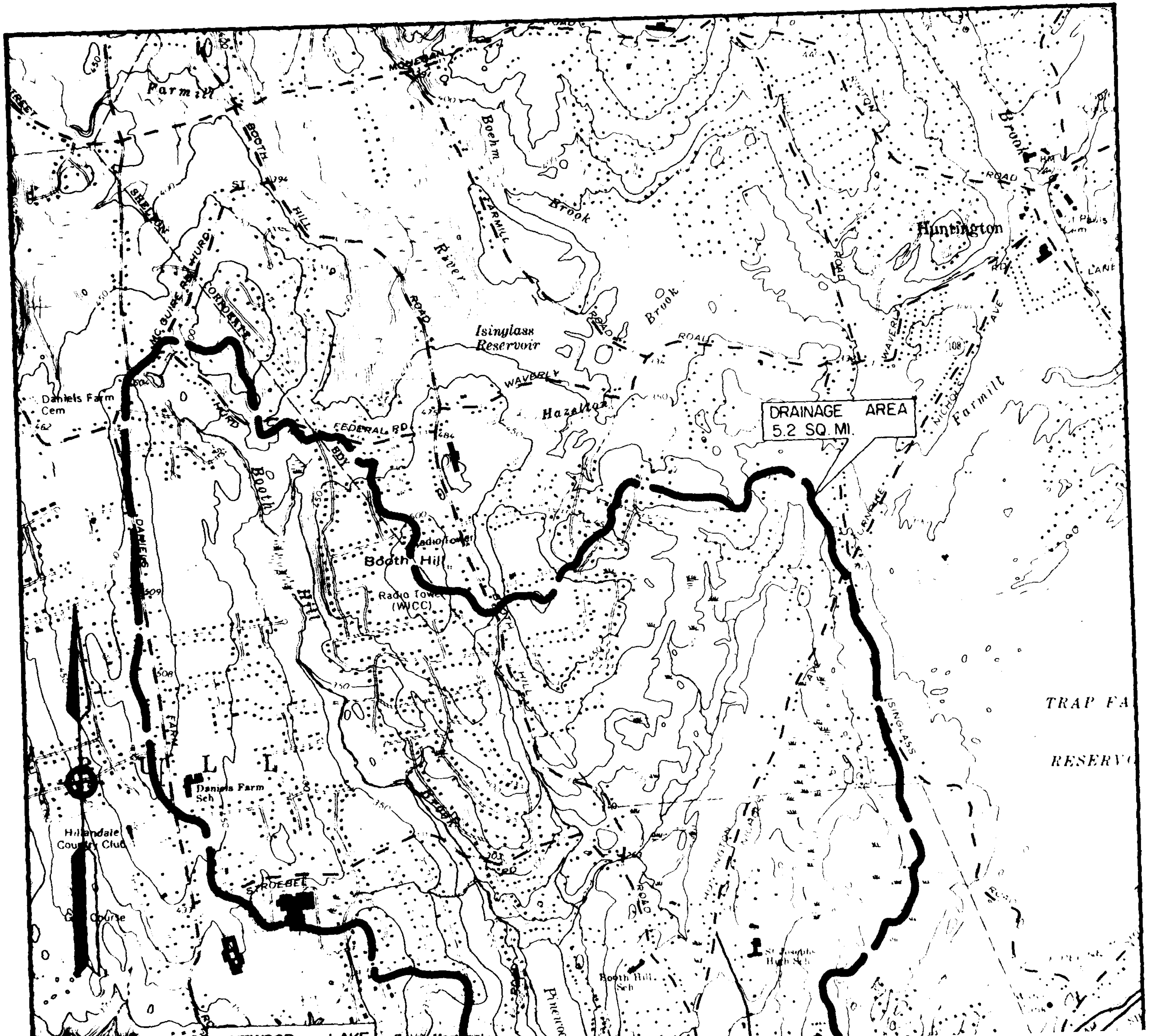
Photo 8 - Spillway discharge channel (Sept 1979)

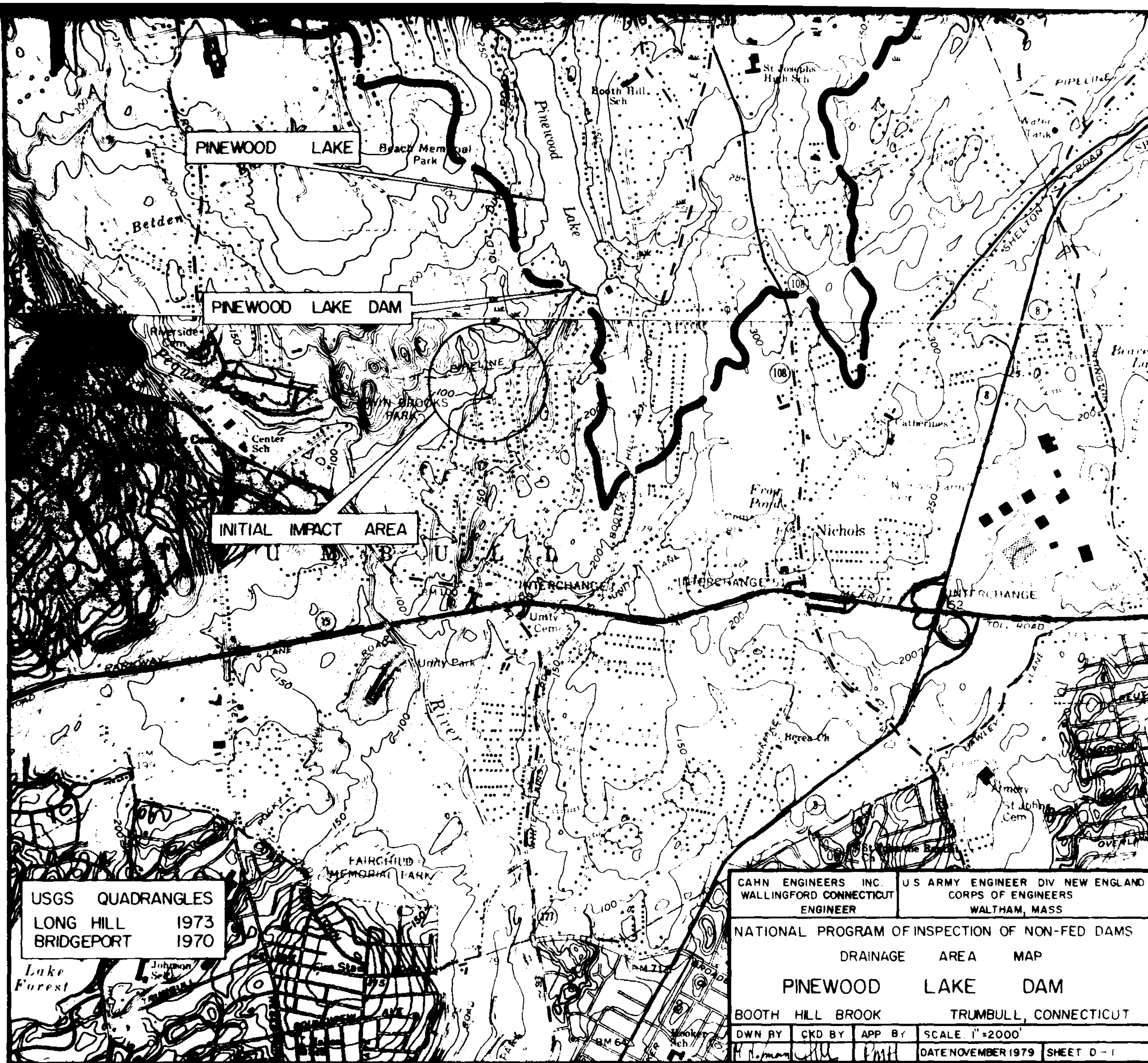
Photo 9 - Crest and concrete retaining wall of dike (Sept. 1979)

Photo 10 - Upstream riprap of dike (Sept. 1979)

APPENDIX D

HYDRAULIC/HYDROLOGIC COMPUTATIONS


DRAINAGE AREA
5.2 SQ. MI.
Isinglass Reservoir
Booth Hill
Radio Tower (WICC)
Huntington
Boehm Brook
River
Farmill
Hazelton
Daniels Farm Cem
Daniels Farm Sch
Hillandale Country Club
Course
Booth Hill Sch
Pinewood
PINEWOOD LAKE
TRAP FA
RESERV


PINEWOOD LAKE
PINEWOOD LAKE DAM
INITIAL IMPACT AREA
USGS QUADRANGLES
LONG HILL 1973
BRIDGEPORT 1970
CAHN ENGINEERS INC.
WALLINGFORD CONNECTICUT
ENGINEER
U S ARMY ENGINEER DIV NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS
DRAINAGE AREA MAP
PINEWOOD LAKE DAM
BOOTH HILL BROOK
TRUMBULL, CONNECTICUT
DWN BY
CKD BY
APP BY
SCALE 1"=2000'
DATE NOVEMBER 1979
SHEET D-1
Pinewood Lake
Booth Hill Sch
St Josephs High Sch
Beach Memorial Park
Betden
Riverside Cem
Center Sch
Twin Brooks Park
Nichols
Frog Pond
Interchange
Interchange 52
Unity Cem
Unity Park
River
Fairchild Memorial Park
Lake Forest
Johnson Sch
Hooker Sch
Armory
St Johns Cem
Pipeline
Water Tank
Shelton Road
Toll Road
Merritt

HYDROLOGIC/HYDRAULIC INSPECTION

PINEWOOD LAKE DAM, TRUMBULL, CT

I. PERFORMANCE AT TEST FLOOD CONDITIONS

1) MAXIMUM PROBABLE FLOOD

a) WATERSHED CLASSIFIED AS "ROLLING"

b) WATERSHED AREA D.A. = 5.2 SQ MI.
FROM CONNECTICUT DEPT. OF ENVIRONMENTAL PROTECTION
BULLETIN No. 1 (PREPARED BY U.S. GEOLOGICAL SURVEY)

c) FROM NED-ACE "PRELIMINARY GUIDANCE FOR ESTIMATING MAX. PROBABLE DISCHARGES" - GUIDE CURVE FOR PMF - PEAK FLOW RATES.

PMF ≅ 1850 CFS/SQ.MI

d) PEAK INFLOW PMF ≅ 1850 × 5.2 ≅ 9600 CFS

2) TEST FLOOD

a) CLASSIFICATION OF DAM ACCORDING TO NED-ACE RECOMMENDED GUIDELINES:

1) SIZE*: STORAGE (MAX) ≅ 920 Ac·Ft (50 < S < 1000 Ac·Ft)
HEIGHT ≅ 22' (6' < H < 25')

* STORAGE: C.E. BY V = 0.5 AH, & BY EXTRAPOLATION OF SURCHARGE STORAGE CURVE BASED ON SURFACE AREA AT ELEV.'S 168 MSL (58.8 Ac), 180' MSL (83.6 Ac) & 190 MSL (102.6 Ac). NOTE BY TRUMBULL TOWN ENGINEER (11/77) STORAGE = 315 MG (630 Ac·Ft) FROM FILES OF BRIDGEPORT HYDRAULIC CO.

PINEWOOD LAKE DAM

2a CONT'D) CLASSIFICATION

HEIGHT : FIELD SURVEY BY CAHN ENGINEERS 10/79. DOWNSTREAM TOE OF DAM ELEV. 151.3, TOP OF DAM ELEV 173.3

ii) HAZARD POTENTIAL: THE DAM IS LOCATED (±) 2400' U/S FROM A LARGE RESIDENTIAL NEIGHBORHOOD. THE HOMES ALONG TWIN BROOK AT THE IMPACT AREA ARE (±) 6' ABOVE THE STREAM.

iii) CLASSIFICATION

SIZE : SMALL

HAZARD : HIGH

b) TEST FLOOD = PMF = 9600 CFS 1/2 PMF = 4800 CFS

3) SURCHARGE AT PEAK INFLOWS

a) PEAK INFLOW : Q_{P_1} = PMF = 9600 CFS Q'_{P_1} = 1/2 PMF = 4800 CFS

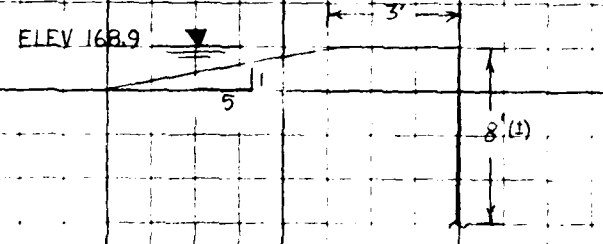
b) OUTFLOW RATING CURVE

i) SPILLWAY

THE SPILLWAY IS OF MASONRY CONSTRUCTION, WITH 185' CREST AT (±) 168.9 MSL. THE U/S FACE OF THE SPILLWAY IS 5^H TO 1^V SLOPE. THE HEIGHT BETWEEN SPILLWAY AND TOP OF DAM (ELEV. 173.3 MSL) IS (±) 4.4'. SEE DIAGRAM PAGE 3.

PINEWOOD LAKE DAM

3b CONT.) OUTFLOW RATING CURVE



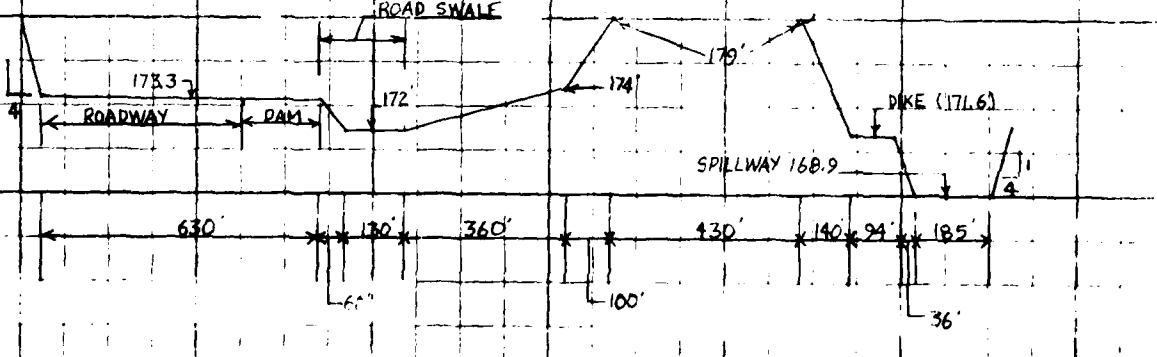
INFORMATION FROM C.E. FIELD SURVEY 9/79

∴ SPILLWAY DISCHARGE COEFFICIENT ASSUME C = 3.1

SEE SUMMARY FOR SPILLWAY CAPACITY VS. LAKE ELEVATION, PAGE 9

(c) EXTENSION OF RATING CURVE FOR SURCHARGE HEADS ABOVE TOP OF DAM

THE DAM IS A EARTH EMBANKMENT WITH A CREST ELEVATION OF 173.3' MSL. THE D/S FACE OF THE DAM IS VERTICAL AND IS CONSTRUCTED OF STONE. THE EARTH EMBANKMENT IS (±) 42' WIDE, AND THE U/S FACE IS (±) 2^{H} TO 1^{V}.



PINEWOOD LAKE DAM

3b CONT'D) OUTFLOW RATING CURVE

ASSUME C = 2.7 FOR OVERFLOW AT SIDES OF DAM, DIKE, SPILLWAY, & ROAD SWALE
C = 3.0 FOR DAM, DIKE,
C = 3.1 FOR SPILLWAY

ASSUME EQUIVALENT FLOWS FOR THE SLOPING PORTIONS OF THE SIDES OF DAM, DIKE, SPILLWAY, AND ROAD SWALE AS FOLLOWS:

DAM

LEFT SLOPE ; $Q_{DL} = 2/3\,(4)(2.7)(H-4.4)^{5/2} \approx 7.2\,(H-4.4)^{5/2}$

ROAD SWALE

RIGHT SLOPE (1) ; $Q_{RS_1} = 2/3\,(360/2)(2.7)(H-3.1)^{5/2} \approx 320\,(H-3.1)^{5/2}$ WHEN $H \leq 5.1$

$Q'_{RS_1} = 2.7(360)(H-3.6)^{3/2} \approx 970\,(H-3.6)^{3/2}$ WHEN $H > 5.1$

(2) $Q_{RS_2} = 2/3\,(100/5)(2.7)(H-5.1)^{5/2} \approx 36\,(H-5.1)^{5/2}$

LEFT SLOPE $Q_{RSL} = 2/3\,(60/1.3)(2.7)(H-3.1)^{5/2} \approx 83\,(H-3.1)^{5/2}$ WHEN $H \leq 4.4$

$Q'_{RSL} = 2.7(60)(H-3.4)^{3/2} = 162\,(H-3.4)^{3/2}$ WHEN $H > 4.4$

DIKE

LEFT SLOPE; $Q_{DKL} = 2/3\,(140/7.4)(2.7)(H-2.7)^{5/2} \approx 34\,(H-2.7)^{5/2}$

PINEWOOD LAKE DAM

3b CONT'D) OUTFLOW RATING CURVES

SPILLWAY

LEFT SLOPE ; $Q_{SPL} = 2/3(36/2.7)(2.7)H^{5/2} \approx 24 H^{5/2}$ WHEN $H \leq 2.7'$

$Q'_{SPL} = 2.7(36)(H-0.6)^{3/2} \approx 97(H-0.6)^{3/2}$ WHEN $H > 2.7'$

RIGHT SLOPE ; $Q_{SPR} = 2/3(4)(2.7)H^{5/2} = 7.2 H^{5/2}$

THE TOTAL OVERFLOW RATING CURVE CAN BE APPROXIMATED BY :

$$Q \approx \underset{\text{(DAM \& ROADWAY)}}{1900(H-4.4)^{3/2}} + \underset{\text{(ROAD SWALE)}}{350(H-3.1)^{3/2}} + \underset{\text{(DIKE)}}{280(H-2.7)^{3/2}} + \underset{\text{(SPILLWAY)}}{570 H^{3/2}} + Q_{DL} + (Q_{RSL} \text{ or } Q'_{RSL}) + (Q_{SR_1} \text{ or } Q'_{SR_1}) + Q_{SR_2} + Q_{DKL} + (Q_{SPL} \text{ OR } Q'_{SPL}) + Q_{SPR}$$

THE OUTFLOW CURVE IS PLOTTED ON THE NEXT PAGE

C) SPILLWAY CAPACITIES

SEE SUMMARY FOR SPILLWAY CAPACITY VS LAKE ELEVATION, PG 9

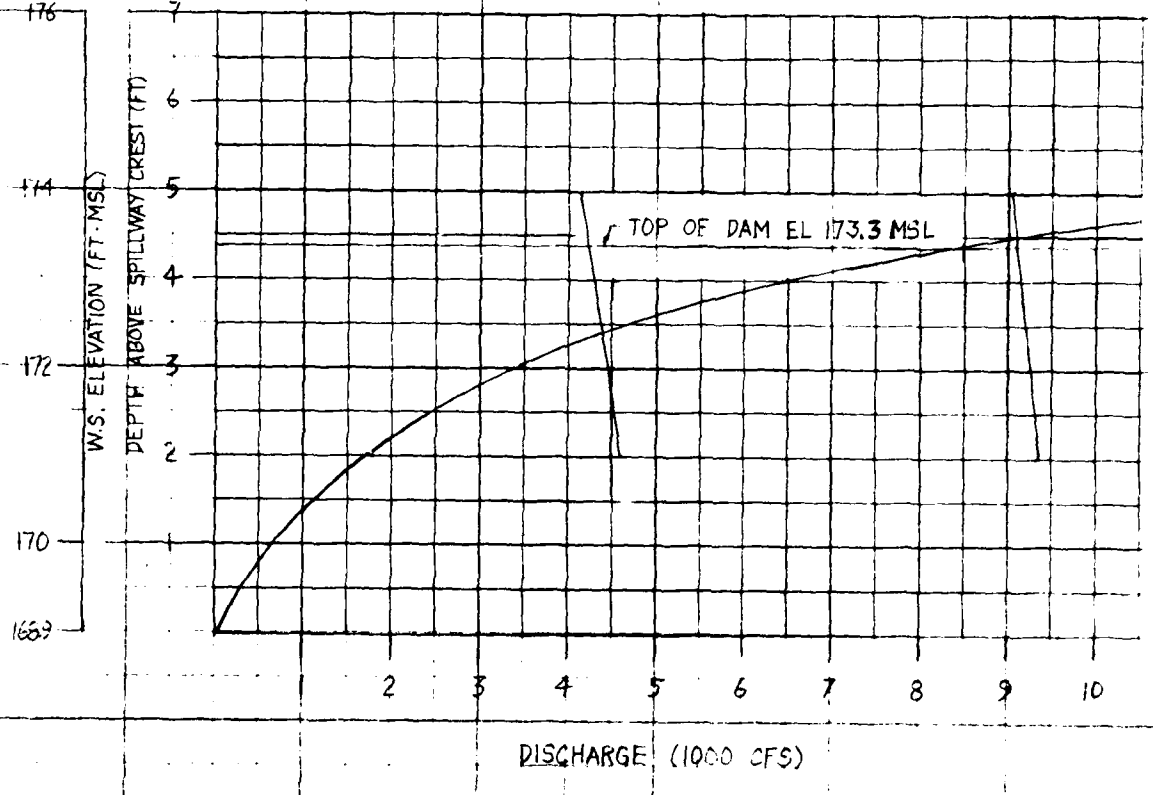
D) SURCHARGE HEIGHT TO PASS Q_R

i) @ Q_R = PMF $\approx$ 9600 CFS, $H_1 \approx$ 4.5'

ii) @ Q'_R = 1/2 PMF $\approx$ 4800 CFS, $H'_1 \approx$ 3.6

PINEWOOD LAKE DAM

3 - CONT'D) OUTFLOW RATING CURVE



THERE IS A 20" DUCTILE IRON PIPE, L = 140', AT ELEV (±) 161.4', IN THE EARTH EMBANKMENT. THE MAXIMUM DISCHARGE THAT CAN BE ANTICIPATED IS ROUGHLY 60 CFS, ASSUMING A HEAD TO THE TOP OF THE DAM OF (±) 12'. THIS MINIMAL FLOW WAS NOT CONSIDERED IN COMPUTING THE RATING CURVE.

PINEWOOD LAKE DAM

4) EFFECT OF SURCHARGE ON PEAK OUTFLOW

a) LAKE AREA @ FLOW LINE * A_o = 58.8 Ac

b) ASSUME NORMAL POOL LEVEL AT SPILLWAY CREST (ELEV 168.9' MSL)

c) WATERSHED AREA : D.A. = 5.2 SQ. MI.

D) DISCHARGE (Q_{P_2}) AT VARIOUS SURCHARGE ELEVATIONS

H = 5 V = 5 × 68 = 340 Ac Ft ∴ S = 340/(5.2 × 53.3) ≅ 1.22"

H = 2' V = 2 × 68 = 136 Ac Ft ∴ S = 136/(5.2 × 53.3) ≅ 0.49"

∴ FROM APPROXIMATE STORAGE ROUTING NED-ACE GUIDELINES FOR 19" MAX PROBABLE R.O. IN NEW ENGLAND

$Q_{P_2} = Q_{P_1}(1 - S/19)$ AND FOR 1/2 PMF $Q_{P_2}' = Q_{P_1}'(1 - S/9.5)$

∴ FOR

H = 5' $Q_{P_2} \cong 9000$ $Q_{P_2}' \cong 4700$

H = 2' $Q_{P_2} \cong 9300$ $Q_{P_2}' \cong 4600$

* C.E. MEASURE (USGS 1:24000) $A_o \cong 58.8$ Ac (EL 168.9' MSL); A = 83.6 Ac @ EL. 180 (MSL)
∴ ASSUME AVG. LAKE AREA WITHIN EXPECTED SURCHARGE 68 Ac

PINEWOOD LAKE DAM

4 CONT'D) EFFECT OF SURCHARGE STORAGE ON PEAK OUTFLOW

E) PEAK OUTFLOW (Q_{P_3})

USING NED-ACE GUIDELINES "SURCHARGE STORAGE ROUTING" ALTERNATE METHOD

$Q_{P_3} \approx 9100$ CFS $H_3 \approx 4.5'$ FOR Q_{P_1} = PMF

$Q_{P_3}' \approx 4300$ CFS $H_3' \approx 3.4'$ FOR Q_{P_1}' 1/2 PMF

F) SPILLWAY CAPACITY RATIO TO OUTFLOW

SPILLWAY CAPACITY TO TOP OF DAM $Q_S \approx 7000$ CFS

∴ SPILLWAY CAPACITY IS (±) 77% OF THE PMF OUTFLOW AND (±) 163% OF THE 1/2 PMF OUTFLOW (SEE SUMMARY FOR ADDITIONAL DATA)

5) SUMMARY

A) PEAK INFLOW Q_{P_1} = PMF ≈ 9600 CFS Q_{P_1}' = 1/2 PMF ≈ 4800 CFS

B) PEAK OUTFLOW $Q_{P_3} \approx 9100$ CFS $Q_{P_3}' \approx 4300$ CFS

THEREFORE, AT THE PMF THE DAM IS OVERTOPPED (±) 0.1' (WS EL 173.4' MSL) OR, TO AN AVG SURCHARGE ABOVE SPILLWAY CREST OF (±) 4.5', AND ABOVE THE ROAD SWALE (±) 1.4'.

AT 1/2 PMF, THE DAM IS NOT OVERTOPPED, (WS EL 172.3' MSL) AND THE AVG

PINEWOOD LAKE DAM

5. CONT'D) SUMMARY

SURCHARGE ABOVE THE SPILLWAY CREST IS (±) 3.4' AND ABOVE THE ROAD SWALE IS (±) 0.3'.

LAKE ELEV (MSL)	SPILLWAY CAPACITY Q_S (CFS)	SPILLWAY CAP. AS % OF INFLOWS & OUTFLOWS			
		Q_A (9600 CFS)	Q_{P_1} (4800 CFS)	Q_{P_3} (9100 CFS)	Q_{P_3} (4300 CFS)
172 (2)*	3700	39	77	41	86
173.3 (3)*	7000	73	146	77	163
173.4	7300	76	152	80	170

NOTES:

*(1) The DIKE CONSIDERED EQUIVALENT TO AN AUXILIARY SPILLWAY AND ITS CAPACITY HAS BEEN INCLUDED IN THE CAPACITY OF THE MAIN SPILLWAY AS FOLLOWS:

LAKE ELEV. (MSL)	Q_S (CFS) SPILLWAY	Q_{DK} (CFS) DIKE	Q_T (CFS) TOTAL
172	3600	100	3700
173.3	6300	700	7000
173.4	6500	800	7300

(2)* JUST BEFORE ROAD SWALE OVERTOPPED

(3)* JUST BEFORE DAM OVERTOPPED (400 CFS ALSO PASSING OVER ROAD SWALE, NOT CONSIDERED AN AUXILIARY SPILLWAY BUT LOWEST POINT OF OVERTOPPING AT PINEWOOD LAKE DAM).

PINEWOOD LAKE DAM

II) DOWNSTREAM FAILURE HAZARD

1) PEAK FLOOD AND STAGE IMMEDIATELY D/S FROM DAM

a) BREACH WIDTH

i) MID-HEIGHT (½) ELEV. 162' MSL (173.3 - 22'/2 ≈ 162')* SEE "HEIGHT" PG. 2

ii) APPROX. MID HEIGHT LENGTH $L \cong 110'$ (SCALED FROM TOWN OF TRUMBULL AERIAL SURVEY; 1" = 100', 2' CONTOURS)

iii) BREACH WIDTH (SEE NED-ACE D/S DAM FAILURE GUIDELINES)

$W = 0.4 \times 110 = 44'$ ASSUME $W_b = 40'$

b) PEAK FAILURE OUTFLOW (Q_{P_1})

ASSUME SURCHARGE TO TOP OF DAM (EL 173.3' MSL)

i) HEIGHT AT TIME OF FAILURE $Y_o \cong 22'$

ii) SPILLWAY DISCHARGE $Q_s \cong 7000$ CFS.
ROAD SWALE DISCHARGE $Q_{RS} \cong 1400$ CFS

∴ TOTAL DISCHARGE, $Q_T \cong 8400$ CFS

iii) BREACH OUTFLOW

$Q_b = 8/27 (W_b) \sqrt{g} Y_o^{3/2} \cong 6900$ CFS

iv) PEAK FAILURE OUTFLOW $Q_{P_1} \cong Q_s + Q_b \cong 15300$

PINEWOOD LAKE DAM

1- CONT'D) PEAK FLOOD STAGE IMMEDIATELY D/S FROM THE DAM

C) FLOOD DEPTH IMMEDIATELY D/S FROM DAM

$Y = 0.44\,Y_o \cong 10'$

D) APPROXIMATE STAGE JUST BEFORE FAILURE

i) $Q = Q_T \cong 8400$ CFS

ii) CHANNEL D/S FROM DAM

THE (±) 2400' REACH OF A BROOK D/S OF PINEWOOD LAKE DAM TO THE IMPACT AREA IS A V-SHAPED CHANNEL WITH (±) 7^H TO 1^V AND (±) 10^H TO 1^V SIDE SLOPES. THE CHANNEL SLOPE IS (±) 2.2%

iii) STAGE Q @ 8400 CFS $Y \cong 9.1$ ($n \cong 0.005$)

E) RAISE IN STAGE AFTER FAILURE AT IMPACT AREA

i) APPROXIMATE STAGE AT POTENTIAL IMPACT AREA AFTER FAILURE

$Q_{P_1} = 15300$ CFS $\therefore Y_1 \cong 11.3'$; $V_1 \cong 59.8$ Ac.Ft. < S/2 (ON REACH OF 2400')

$Q_{P_2} = Q_{P_1}(1 - V/S) \cong 14300$ CFS ; $Y_2 \cong 11.1'$; $Y_2 \cong 57.7$ Ac.Ft ; $\bar{V} \cong 58.8$ Ac.Ft

$Q_{P_3} \cong 14300$ CFS $Y_3 \cong 11.1'$

$\therefore$ REACH OUTFLOW $Q_{P_3} \cong 14300$ CFS $Y_3 \cong 11.1'$

PINEWOOD LAKE DAM

1- CONT'D) PEAK FLOOD STAGE IMMEDIATELY D/S FROM DAM

ii) RAISE IN STAGE AT IMPACT AREA $\Delta Y \approx 11.1 - 9.1 \approx 2.0$

2) SUMMARY

a) PEAK FAILURE OUTFLOW $Q_{P_f} \approx 15300$ CFS $Y_f \approx 11.3$

b) CONDITIONS AT IMPACT AREA

i) APPROXIMATE STAGE BEFORE FAILURE $Y \approx 9.1'$ ($Q_s \approx 8400$ CFS)

ii) APPROXIMATE STAGE AFTER FAILURE $Y \approx 11.1'$ ($Q_s \approx 14300$ CFS)

iii) APPROXIMATE RAISE IN STAGE AFTER FAILURE $\Delta Y \approx 2.0'$

PRELIMINARY GUIDANCE FOR ESTIMATING MAXIMUM PROBABLE DISCHARGES IN PHASE I DAM SAFETY INVESTIGATIONS

New England Division
Corps of Engineers

March 1978

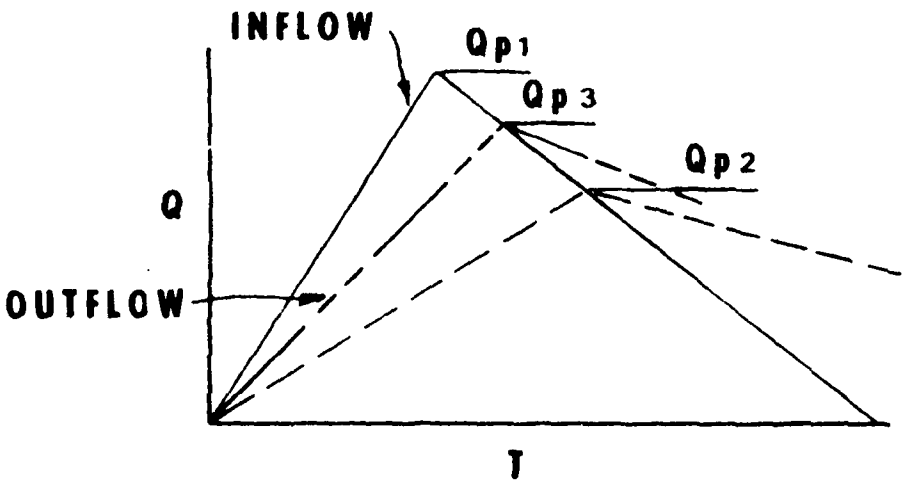
MAXIMUM PROBABLE FLOOD INFLOWS
NED RESERVOIRS

	Project	Q (cfs)	D.A. (sq. mi.)	MPF cfs/sq. mi.
1.	Hall Meadow Brook	26,600	17.2	1,546
2.	East Branch	15,500	9.25	1,675
3.	Thomaston	158,000	97.2	1,625
4.	Northfield Brook	9,000	5.7	1,580
5.	Black Rock	35,000	20.4	1,715
6.	Hancock Brook	20,700	12.0	1,725
7.	Hop Brook	26,400	16.4	1,610
8.	Tully	47,000	50.0	940
9.	Barre Falls	61,000	55.0	1,109
10.	Conant Brook	11,900	7.8	1,525
11.	Knightville	160,000	162.0	987
12.	Littleville	98,000	52.3	1,870
13.	Colebrook River	165,000	118.0	1,400
14.	Mad River	30,000	18.2	1,650
15.	Sucker Brook	6,500	3.43	1,895
16.	Union Village	110,000	126.0	873
17.	North Hartland	199,000	220.0	904
18.	North Springfield	157,000	158.0	994
19.	Ball Mountain	190,000	172.0	1,105
20.	Townshend	228,000	106.0(278 total)	820
21.	Surry Mountain	63,000	100.0	630
22.	Otter Brook	45,000	47.0	957
23.	Birch Hill	88,500	175.0	505
24.	East Brimfield	73,900	67.5	1,095
25.	Westville	38,400	99.5(32 net)	1,200
26.	West Thompson	85,000	173.5(74 net)	1,150
27.	Hodges Village	35,600	31.1	1,145
28.	Buffumville	36,500	26.5	1,377
29.	Mansfield Hollow	125,000	159.0	786
30.	West Hill	26,000	28.0	928
31.	Franklin Falls	210,000	1000.0	210
32.	Blackwater	66,500	128.0	520
33.	Hopkinton	135,000	426.0	316
34.	Everett	68,000	64.0	1,062
35.	MacDowell	36,300	44.0	825

MAXIMUM PROBABLE FLOWS BASED ON TWICE THE STANDARD PROJECT FLOOD (Flat and Coastal Areas)

River	SPF (cfs)	D.A. (sq. mi.)	MPF (cfs/sq. mi.)
1. Pawtuxet River	19,000	200	190
2. Mill River (R.I.)	8,500	34	500
3. Peters River (R.I.)	3,200	13	490
4. Kettle Brook	8,000	30	530
5. Sudbury River.	11,700	86	270
6. Indian Brook (Hopk.)	1,000	5.9	340
7. Charles River.	6,000	184	65
8. Blackstone River.	43,000	416	200
9. Quinebaug River	55,000	331	330

ESTIMATING EFFECT OF SURCHARGE STORAGE ON MAXIMUM PROBABLE DISCHARGES



STEP 1: Determine Peak Inflow (Qp_1) from Guide Curves.

STEP 2: a. Determine Surcharge Height To Pass "Qp_1".

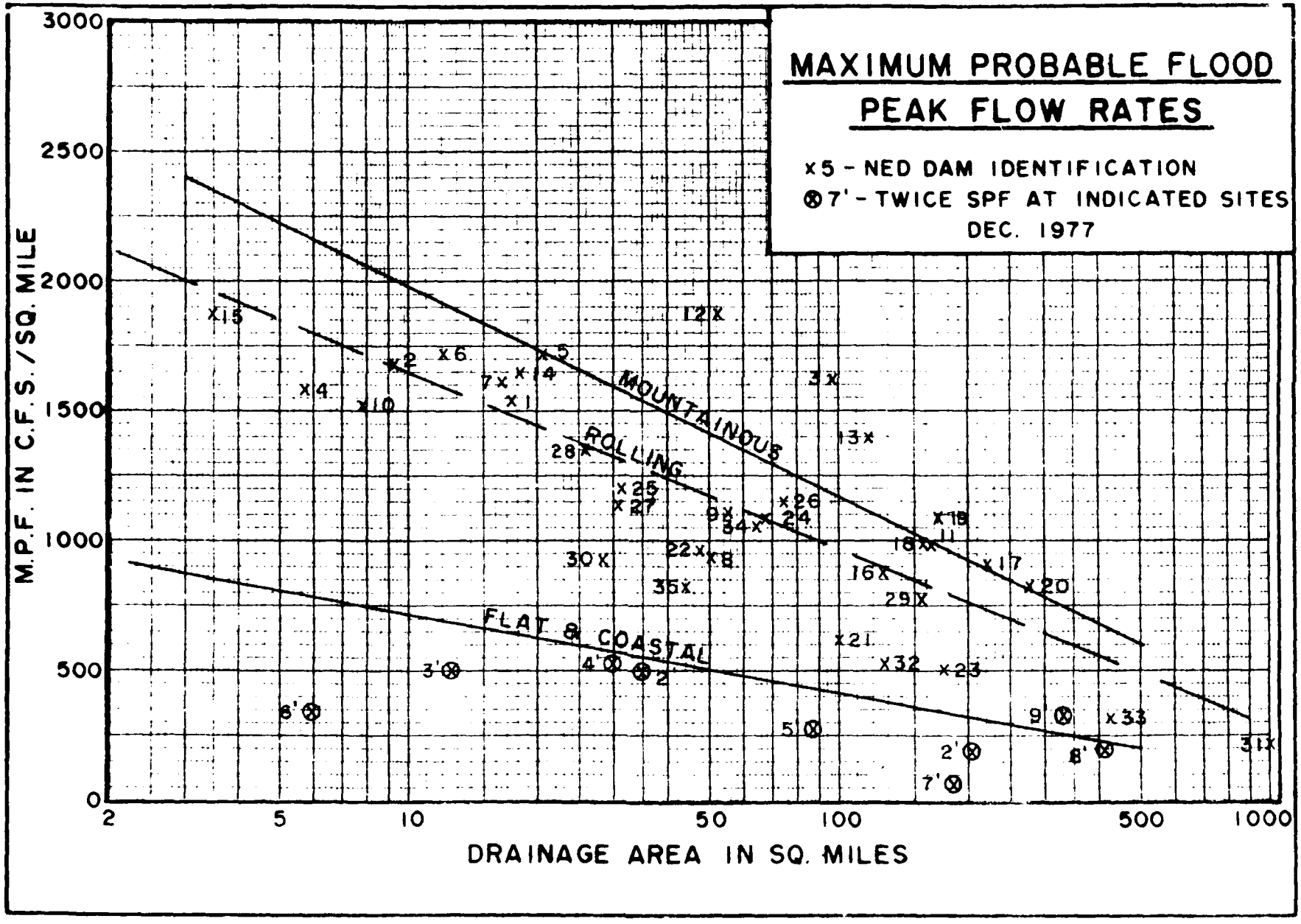
b. Determine Volume of Surcharge ($STOR_1$) In Inches of Runoff.

c. Maximum Probable Flood Runoff In New England equals Approx. 19", Therefore:

$$Qp_2 = Qp_1 \times \left(1 - \frac{STOR_1}{19}\right)$$

STEP 3: a. Determine Surcharge Height and "$STOR_2$" To Pass "Qp_2"

b. Average "$STOR_1$" and "$STOR_2$" and Determine Average Surcharge and Resulting Peak Outflow "Qp_3".


MAXIMUM PROBABLE FLOOD
PEAK FLOW RATES
x5 - NED DAM IDENTIFICATION
⊗7' - TWICE SPF AT INDICATED SITES
DEC. 1977
M.P.F. IN C.F.S./SQ. MILE
DRAINAGE AREA IN SQ. MILES
3000
2500
2000
1500
1000
500
0
2
5
10
50
100
500
1000
MOUNTAINOUS
ROLLING
FLAT & COASTAL
x15
x4
x10
x2
x6
x3
7x
x14
x1
28x
12x
3x
13x
x25
x27
x26
9x
34x
24
x18
11
18x
x17
x20
30x
22x
x8
35x
16x
29x
x21
x32
x23
31x
3'⊗
4'⊗
2
8'⊗
5'⊗
9⊗
x33
2'⊗
8'⊗
7'⊗

SURCHARGE STORAGE ROUTING SUPPLEMENT

STEP 3: a. Determine Surcharge Height and "$STOR_2$" To Pass "Qp_2"

b. Avg "$STOR_1$" and "$STOR_2$" and Compute "Qp_3".

c. If Surcharge Height for Qp_3 and "$STOR_{AVG}$" agree O.K. If Not:

STEP 4: a. Determine Surcharge Height and "$STOR_3$" To Pass "Qp_3"

b. Avg. "Old $STOR_{AVG}$" and "$STOR_3$" and Compute "Qp_4"

c. Surcharge Height for Qp_4 and "New $STOR_{Avg}$" should Agree closely

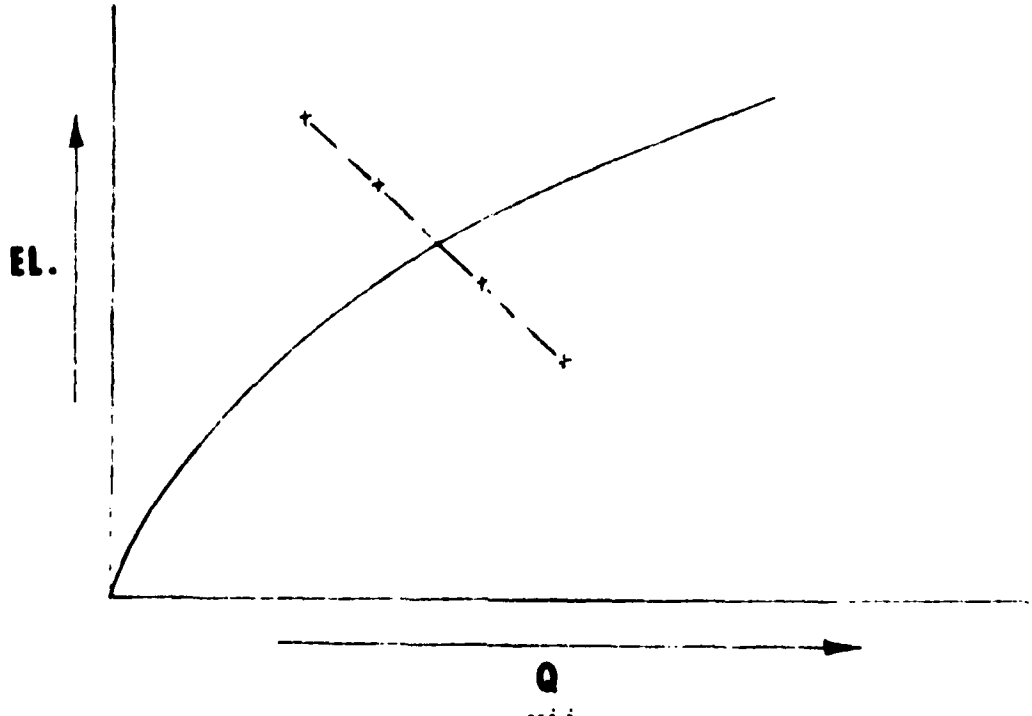
SURCHARGE STORAGE ROUTING ALTERNATE

$$Q_{p2} = Q_{p1} \times \left(1 - \frac{STOR}{19}\right)$$

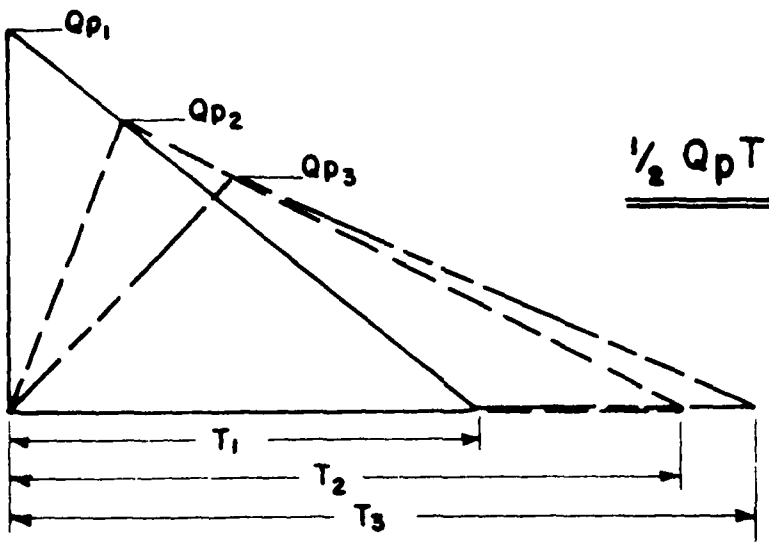
$$Q_{p2} = Q_{p1} - Q_{p1}\left(\frac{STOR}{19}\right)$$

FOR KNOWN Q_{p1} AND 19'' R.O.

Q_{p2} STOR EL.



"RULE OF THUMB" GUIDANCE FOR ESTIMATING DOWNSTREAM DAM FAILURE HYDROGRAPHS



$\frac{1}{2} Q_p T = 12 S$

STEP 1: DETERMINE OR ESTIMATE RESERVOIR STORAGE (S) IN AC-FT AT TIME OF FAILURE.

STEP 2: DETERMINE PEAK FAILURE OUTFLOW (Q_{p1}).

$$Q_{p_1} = \frac{8}{27} W_b \sqrt{g} Y_o^{3/2}$$

W_b = BREACH WIDTH - SUGGEST VALUE NOT GREATER THAN 40% OF DAM LENGTH ACROSS RIVER AT MID HEIGHT.

Y_o = TOTAL HEIGHT FROM RIVER BED TO POOL LEVEL AT FAILURE.

STEP 3: USING USGS TOPO OR OTHER DATA, DEVELOP REPRESENTATIVE STAGE-DISCHARGE RATING FOR SELECTED DOWNSTREAM RIVER REACH.

STEP 4: ESTIMATE REACH OUTFLOW (Q_{p2}) USING FOLLOWING ITERATION.

A. APPLY Q_{p1} TO STAGE RATING, DETERMINE STAGE AND ACCOPMANYING VOLUME (V_1) IN REACH IN AC-FT. (NOTE: IF V_1 EXCEEDS 1/2 OF S, SELECT SHORTER REACH.)

B. DETERMINE TRIAL Q_{p2}.

$$Q_{p_2}(\text{TRIAL}) = Q_{p_1}\left(1 - \frac{V_1}{S}\right)$$

C. COMPUTE V_2 USING Q_{p2} (TRIAL).

D. AVERAGE V_1 AND V_2 AND COMPUTE Q_{p2}.

$$Q_{p_2} = Q_{p_1}\left(1 - \frac{V_{avg}}{S}\right)$$

STEP 5: FOR SUCCEEDING REACHES REPEAT STEPS 3 AND 4.

APRIL 1978

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS